CONSISTENT STRESS DISTRIBUTIONS IN FINITE ELEMENTS

By

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CHAPTER I

INTRODUCTION

Stress distributions in finite elements are conventionally calculated from strain components obtained by differentiation of the assumed element displacement fields. These stresses are typically significantly less accurate than the displacements and also are discontinuous at element interfaces. A smoothing technique is available which markedly improves the quality of the calculated stresses while providing a continuous, single-valued stress prediction. The approach, based on the minimum potential energy principal, leads to a stress field which is a least square error fit to the conventional stress distribution (1). This paper reviews the basic theory, illustrates the installation of the method in an existing finite element computer code, and demonstrates the accuracy achieved through numerical examples.

CHAPTER II

BASIC THEORY

The procedure adopted in this paper for the calculation of "consistent stresses" evolves from the minimization of the total potential energy of the finite element system (2). In the computations which follow, $\{\bar{\sigma}\}$ and $\{\bar{\varepsilon}\}$ are used to denote the finite element stress and strain vectors. The vectors $\{\sigma\}$ and $\{\varepsilon\}$ are used to represent exact stresses and strains, and [D] is used to represent an elasticity matrix. The relationship between the stresses and strains is

$$\{\bar{\varepsilon}\} = [\bar{D}]\{\bar{\sigma}\}$$

and

$$\{\varepsilon\} = [D]\{\sigma\}.$$

The total potential energy of the finite element system, denoted by π, is equal to the strain energy stored in the system minus the work done by the applied loads and reactions. In equation form the total potential energy is

$$\pi = SE - W. \qquad (1)$$

The energy stored in the finite element system in the form of strain energy is equal to

$$\int_v \frac{1}{2} \{\bar{\sigma}\}^T \{\bar{\varepsilon}\}\, dv$$

where v represents the volume of the system. The work done by the external forces and reactions of the system is equal to

$$\{R\}^T \{\bar{u}\}.$$

In this equation $\{R\}^T$ represents the vector of applied forces and reactions and $\{\bar{u}\}$ is a vector of finite element nodal displacements. Substituting these values in Equation (1), the total potential energy of the system becomes

$$\pi = \int_V \frac{1}{2} \{\bar{\sigma}\}^T \{\bar{\varepsilon}\} \, dv - \{R\}^T \{\bar{u}\}. \tag{2}$$

The finite element system is now subjected to a small arbitrary virtual displacement $\{d\bar{u}\}$. These somewhat arbitrary displacements are continuous and compatible with $\{\bar{\varepsilon}\}$. As a result of the imposition of the displacement field, an incremental change in the strain field $\{\sigma\bar{\varepsilon}\}$ results.

From the principal of virtual work the imposition of a virtual displacement causes no change in the total potential energy of the system. Equating the strain energy stored in the system by the exact stresses to the work done by the applied loads and reactions results in

$$\int_V \{\sigma\}^T \{\delta\bar{\varepsilon}\} = \{R\}^T \{d\bar{u}\}.$$

Integrating the above equation leads to

$$\int_V \{\sigma\}^T \{\bar{\varepsilon}\} = \{R\}^T \{\bar{u}\}.$$

Substituting this into Equation (2) for the work term, the total potential energy of the system may be written as

$$\pi = \int_V \frac{1}{2} \{\bar{\sigma}\}^T \{\bar{\varepsilon}\} \, dv - \int_V \{\sigma\}^T \{\bar{\varepsilon}\} \, dv \tag{3}$$

Substituting for $\{\bar{\varepsilon}\}$ in Equation (3),

$$\pi = \int_v \frac{1}{2} \{\bar{\sigma}\}^T [D] \{\bar{\sigma}\} \, dv - \int_v \{\sigma\}^T [D] \{\bar{\sigma}\} \, dv.$$

Regrouping terms in the above equation

$$\pi = \int_v \frac{1}{2} \{\bar{\sigma}-\sigma\}^T [D] \{\bar{\sigma}\} \, dv - \int_v \frac{1}{2} \{\sigma\}^T [D] \{\bar{\sigma}\} \, dv.$$

Simplifying

$$\pi = \int_v \frac{1}{2} \{\bar{\sigma} - \sigma\}^T [D] \{\sigma\} \, dv - \int_v \frac{1}{2} \{\bar{\sigma} - \sigma\}^T [D] \{\sigma\} \, dv$$

$$+ \int_v \frac{1}{2} \{\bar{\sigma} - \sigma\}^T [D] \{\sigma\} \, dv - \int_v \frac{1}{2} \{\sigma\}^T [D] \{\bar{\sigma}\} \, dv$$

or

$$\pi = \int_v \frac{1}{2} \{\bar{\sigma} - \sigma\}^T [D] \{\bar{\sigma} - \sigma\} \, dv + \int_v \frac{1}{2} \{\bar{\sigma} - \sigma\}^T [D] \{\sigma\} \, dv$$

$$- \int_v \frac{1}{2} \{\sigma\}^T [D] \{\bar{\sigma}\}.$$

Expanding the second term

$$\pi = \int_v \frac{1}{2} \{\bar{\sigma} - \sigma\}^T [D] \{\bar{\sigma} - \sigma\} \, dv + \int_v \frac{1}{2} \{\bar{\sigma}\}^T [D] \{\sigma\} \, dv$$

$$- \int_v \frac{1}{2} \{\sigma\}^T [D] \{\sigma\} \, dv - \int_v \{\sigma\}^T [D] \{\bar{\sigma}\} \, dv. \qquad (4)$$

Using the relationship

$$\int_v \frac{1}{2} \{\sigma\}^T [D] \{\bar{\sigma}\} = \int_v \frac{1}{2} \{\bar{\sigma}\}^T [D]^T \{\sigma\}$$

and the fact that $[D]^T = [D]$, because $[D]$ is a symmetric matrix, Equation (4) reduces to

$$\pi = \int_v \frac{1}{2} \{\bar{\sigma} - \sigma\}^T [D] \{\bar{\sigma} - \sigma\} \, dv + \int_v \frac{1}{2} \{\sigma\}^T [D] \{\sigma\} \, dv.$$

The final integral in this equation,

$$\int_V \frac{1}{2} \{\sigma\}^T \; [D] \; \{\sigma\} \; dv,$$

is a constant and does not depend on the nodal displacements. Therefore, it will be replaced with a constant C and the total potential energy of the system can be written as

$$\pi = \int_V \frac{1}{2} \{\bar{\sigma} - \sigma\}^T \; [D] \; \{\bar{\sigma} - \sigma\} \; dv + C.$$

For a constant [D] matrix, an equivalent functional is

$$\pi = \int_V \{\bar{\sigma} - \sigma\}^T \; \{\bar{\sigma} - \sigma\} \; dv. \tag{5}$$

The integral in Equation (5) is the total squared error in the stress field. Subsequent computations approximate $\{\sigma\}$ to minimize this functional. Equation (5) is expanded:

$$\bar{\pi} = \int_V \{\bar{\sigma}\}^T\{\bar{\sigma}\} \; - \; 2\{\sigma\}^T\{\bar{\sigma}\} \; + \; \{\sigma\}^T\{\sigma\} \; dv.$$

According to the principle of minimum potential energy,

$$d\bar{\pi} = 0 = \delta \,[\int_V \{\bar{\sigma}\}^T\{\bar{\sigma}\} \; dv \; - \; 2\int_V \{\sigma\}^T\{\bar{\sigma}\} \; dv$$

$$+ \int_V \{\sigma\}^T\{\sigma\} \; dv]. \tag{6}$$

A computationally efficient procedure for establishing $\{\sigma\}$ is to assume a piecewise continuous field, interpolated element by element from as yet unknown nodal stresses. Thus for each element:

$$\{\sigma\} \doteq \{N_1\}\,[\sigma_L] \tag{7}$$

where $\{N_L\}$ represents a set of interpolation functions and $[\sigma_L]$ represents the consistent nodal stresses. The $[\sigma_L]$ are then computed to satisfy Equation (6),

$$0 = \frac{\delta}{\delta[\sigma_L]} [\int_V \{\bar{\sigma}\}^T\{\bar{\sigma}\} \, dv - 2\int_V \{\sigma\}^T\{\bar{\sigma}\} \, dv$$

$$+ \int_V \{\sigma\}^T\{\sigma\} \, dv]. \tag{8}$$

Equation (7) is introduced into Equation (8) and the indicated operations performed, giving, for one element,

$$[\int_V \{N_L\}^T\{N_L\}dv][\sigma_L] = \int_V \{N_L\}^T\{\bar{\sigma}\} \, dv.$$

Representing this equation symbolically,

$$[C][\sigma_L] = [P].$$

To solve for the complete set of consistent stresses the above matrices, [C] and [P], will be evaluated for each finite element. The results of these evaluations are then assembled into an overall "force matrix" for the [P] matrices and an overall "smoothing matrix" for the [C] matrices. From these assembled matrices the consistent stresses are solved for by Gaussian elimination or inversion if the system allows.

The following portion of this paper will apply this stress averaging procedure to an already existing finite element program and present a few example solutions.

CHAPTER III

PROGRAM DEVELOPMENT

General

The finite element program to which this stress averaging scheme is applied operates with triangular elements of a constant thickness. Each triangular element connects three external nodes at the triangle vertices and has no interior nodes. The degrees of freedom possessed by each node are five, which include u, v, w, θx, and θy. From the fifteen degrees of freedom per element, three membrane stress resultants and three bending stress resultants are calculated at each node. The output from the program consists of nodal deformations, and node candidate stresses from each element connected to a node. The candidate stresses are the "conventional" stress which will be used in determining the "consistent" stresses.

Sign Convention

The six stress candidates computed by the finite element program include NX, NY, NXY, MX, MY, and MXY. The first three of these NX, NY, and NXY are membrane stress resultants and the last three MX, MY, and MXY are bending stress resultants.

A positive sign convention for the membrane stress results is shown in Figure 1. In Figure 2 the right-hand rule of thumb is used with the bending stress resultants to indicate the positive sign directions.

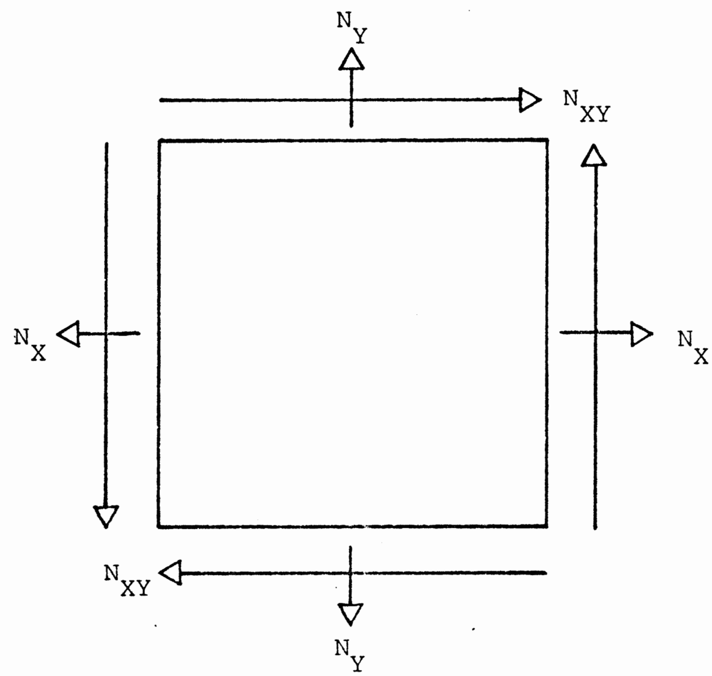


Figure 1. Membrane Stress Sign Convention

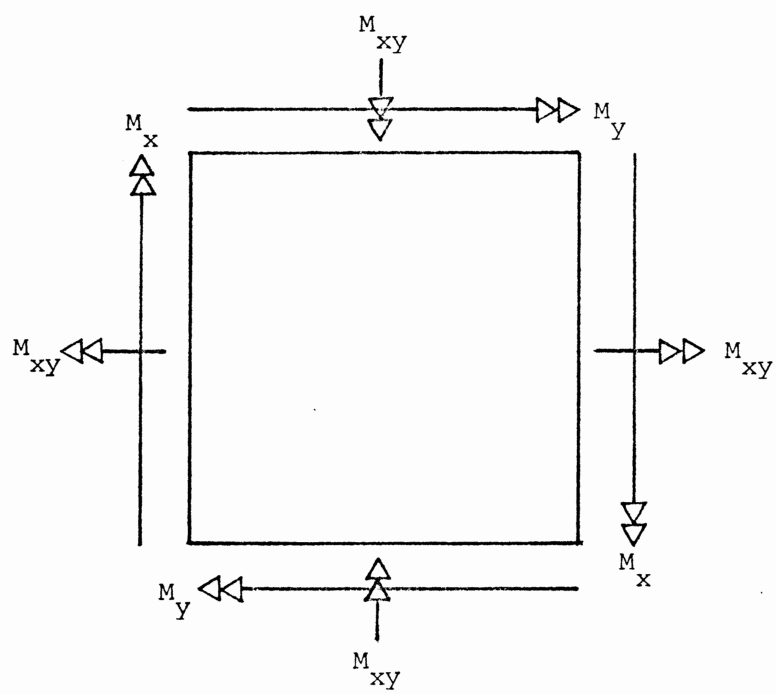


Figure 2. Bending Stress Sign Convention

Stress Rotations

The "conventional" nodal stress resultants calculated for each element, by the finite element program, are initially referenced to the elemental local systems. For the purpose of calculating stress averages, all of these stress resultants must be referenced to a single coordinate system. As a matter of convenience, the global X and Y coordinate system is selected. To perform the transformation from the local to global system, the standard Mohr circle rotation is used. This rotation in matrix form is

$$\begin{bmatrix} \sigma'_x & \tau'_{xy} \\ \tau'_{xy} & \sigma'_y \end{bmatrix} = \begin{bmatrix} \cos\theta & +\sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} \sigma_x & \tau_{xy} \\ \tau_{xy} & \sigma_y \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta \\ +\sin\theta & \cos\theta \end{bmatrix}$$

The angle represented by θ is the angle between the local and global X axis.

Approximation Functions

The paper by J. T. Oden and H. J. Brauchli (2) indicates the choice of interpolation functions $\{N_L\}$ has some influence on the resulting consistent stresses. A convenient and also the most accurate choice of interpolation function is the same set of $\{N_L\}$ used in the original stiffness matrix formulation (3). In this work the triangular elements used display linearly distributed membrane displacements and cubic bending displacements. The linear displacement functions are used in all stress combinations. These functions are defined by the following relationship:

$$\begin{bmatrix} N_i \\ N_j \\ N_K \end{bmatrix} = \begin{bmatrix} X_I & X_J & X_K \\ Y_I & Y_J & Y_K \\ 1 & 1 & 1 \end{bmatrix}^{-1} \begin{bmatrix} X \\ Y \\ 1 \end{bmatrix}$$

In this expression X_I, X_J, and X_K refer to the X coordinates of the vertices of the triangle, and Y_I, Y_J, and Y_K refer to the Y coordinates of the vertices of the triangle.

Global Matrix Formulation

The global "smoothing" matrix is an assembled matrix using the local [C] matrices. The size of this global matrix is G x G, where G is the total number of nodes in the system. To form each of the local [C] matrices, the following equation is evaluated.

$$[C] = \int_V \{N_L\}^T \{N_L\} \, dv.$$

The integration of this expression results in a 3 x 3 matrix which must be placed into the global smoothing matrix. The position in the global matrix to which each entry in the [C] matrix must be added can be found by referring to the matrix below.

$$[C] = \begin{array}{c} \\ I \\ J \\ K \end{array} \begin{array}{c} \begin{array}{ccc} I & J & K \end{array} \\ \begin{bmatrix} C_1 & C_2 & C_3 \\ C_4 & C_5 & C_6 \\ C_7 & C_8 & C_9 \end{bmatrix} \end{array}$$

(The superscripts outside the matrix I, J, and K refer to the vertices of the triangle over which the intergral has been evaluated.) From this representation the position in the global matrix to which C_1 must be added is row I, column I. The position to which C_2 must be added is row I, column J. The position to which C_3 must be added is row I, column K. The rest of the entries in the [C] matrix are placed correctly in the global smoothing matrix by adding them to the rows and columns indicated by the I, J, and K's given outside of the matrix above.

The global force matrix is an assemblage of the local [P] matrices. The size of this global matrix is G x 6, where G again is the number of nodes in the system. The formulation of the local [P] matrices comes from evaluating the expression

$$\int_V \{N_L\}^T \{\bar{\sigma}\} \, dv.$$

The size of each of the local [P] matrices is 3 x 6. The position in the global force matrix to which each column of the local matrix must be added is evident from the matrix below.

$$[P] = \begin{array}{c} I \\ J \\ K \end{array} \begin{bmatrix} A_1 & A_2 & A_3 & A_4 & A_5 & A_6 \\ B_1 & B_2 & B_3 & B_4 & B_5 & B_6 \\ E_1 & E_2 & E_3 & E_4 & E_5 & E_6 \end{bmatrix}$$

Row 1 of the [P] matrix must be added to row I of the global "force matrix." Row 2 of the [P] matrix must be added to row J of the global matrix. Row 3 of the [P] matrix must be added to row K of the global matrix.

CHAPTER IV

NUMERICAL EXAMPLES

A few example problems will now be presented. The first of these examples will be a hand-calculated problem to show how the above procedure is applied. The rest of the examples presented will be solved by computer analysis using the same procedure outlined in the hand-calculated example.

Example Problem No. 1

A square plate of unit thickness with built-in edges has been discretized into a crude finite element system as shown in Figure 3. The plate is loaded at the center with a 400 kip concentrated load directed downward. Using the symmetry aspect of the plate and loading, only one-quarter of the system will be considered in the analysis presented. As a matter of convenience, the lower left-hand quarter has been selected.

The quarter of the plate being analyzed will be numbered for reference as shown (see Figure 4). The following data apply to this finite element system.

Element Incidences

Element	I (Node)	J (Node)	K (Node)
1	1	2	4
2	2	3	4

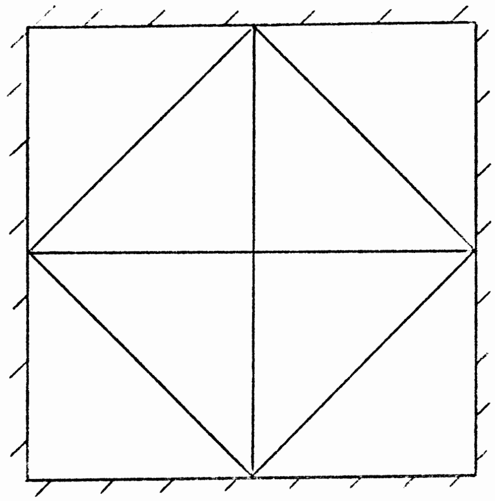


Figure 3. Crude Finite Element Mesh

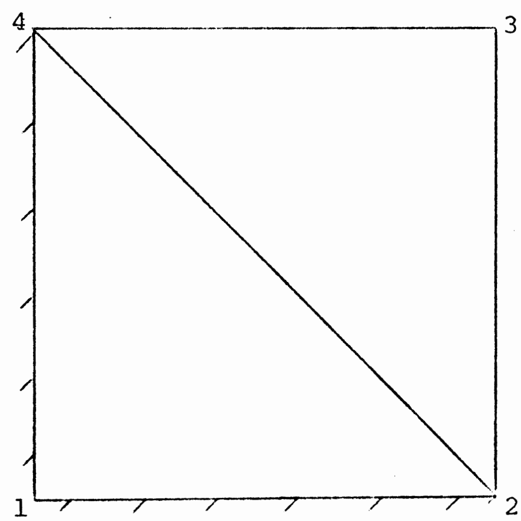


Figure 4. Quarter Symmetry Section
Showing Node Numbering
Sequence

Global Joint Coordinates

Joint	X	Y
1	0	0
2	5	0
3	5	5
4	0	5

The global smoothing matrix for the finite element system will be assembled first. This assemblage requires the evaluation of the local [C] matrix for each element. To evaluate these matrices the local approximation functions, $\{N_L\}$, must first be obtained. These approximation functions will be references to a local system parallel to the global system with its origin at the element centroid.

For element No. 1:

Centroid

$$\bar{x} = (x_I + x_J + x_K)/2 = (0 + 5 + 0)/3 = 5/3$$

$$\bar{y} = (y_I + y_J + y_K)/3 = (0 + 0 + 5)/3 = 5/3$$

The local coordinates of triangle incidences are found using

$$X_L = X_G - X_C \quad \text{and} \quad Y_L = Y_G - Y_C$$

where L refers to the local system, G refers to the global system, and C refers to the element centroid.

For element No. 1:

$$X_1 = 0 - 5/3 = -5/3 \qquad X_2 = 5 - 5/3 = 10/3 \qquad X_3 = 0 - 5/3 = -5/3$$

$$Y_1 = 0 = 5/3 = -5/3 \qquad Y_2 = 0 - 5/3 = -5/3 \qquad Y_3 = 5 - 5/3 = -10/3$$

The local smoothing functions for element No. 1 are:

$$\begin{Bmatrix} N_1 \\ N_2 \\ N_3 \end{Bmatrix} = \begin{bmatrix} -5/3 & 10/3 & -5/3 \\ -5/3 & -5/3 & 10/3 \\ 1 & 1 & 1 \end{bmatrix}^{-1} \begin{Bmatrix} x \\ y \\ 1 \end{Bmatrix}$$

or

$$N_1 = -0.2x - 0.2y + 1/3$$

$$N_2 = 0.2x + \phi y + 1/3$$

$$N_3 = \phi x + 0.2y + 1/3$$

The local [C] matrix may now be found by

$$[C] = \int_v \{N_L\}^T \{N_L\} \, dv$$

or

$$[C] = \int_v \begin{Bmatrix} N_1 \\ N_2 \\ N_3 \end{Bmatrix} \{N_1 \quad N_2 \quad N_3\} \, dv.$$

Using the integrals given in Appendix A, the [C] matrix for element No. 1 is

$$[C_1] = \begin{bmatrix} 2.0832 & 1.0420 & 1.0420 \\ 1.0420 & 2.0832 & 1.0420 \\ 1.0420 & 1.0420 & 2.0832 \end{bmatrix}$$

Performing the same calculations for element No. 2:

Centroid

$$\bar{X} = (5 + 5 + 0)/3 = 10/3$$

$$\bar{Y} = (0 + 5 + 5)/3 = 10/3$$

Local Coordinates

Joint	x_L	y_L
2	5/3	-10/3
3	5/3	5/3
4	-10/3	5/3

Smoothing functions

$$N_2 = \phi x - 0.2y + 1/3$$

$$N_3 = 0.2x + 0.2y + 1/3$$

$$N_4 = -0.2x + \phi y + 1/3$$

The local [C] matrix for element No. 2 is:

$$[C_2] = \begin{bmatrix} 2.0832 & 1.0420 & 1.0420 \\ 1.0420 & 2.0832 & 1.0420 \\ 1.0420 & 1.0420 & 2.0832 \end{bmatrix}$$

Assembling these local [C] matrices results in the global smoothing matrix.

$$[\bar{C}] \begin{bmatrix} 2.0832 & 1.0420 & 0 & 1.0420 \\ 1.0420 & 4.1664 & 1.0420 & 2.0832 \\ 0 & 1.0420 & 2.0832 & 1.0420 \\ 1.0420 & 2.0832 & 1.0420 & 4.1664 \end{bmatrix}$$

The global "force" matrix for the system will now be assembled. To obtain this matrix, the conventional stress candidates are used. From previous analysis the conventional stress resultants in the local system are:

Element	Node	NX	NY	NXY	MX	MY	MXY
1	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	4	0	0	0	0	0	0
2	2	0	0	0	-54.91	-31.40	-23.51
	3	0	0	0	64.73	64.73	23.51
	4	0	0	0	-31.40	-54.91	-23.51

Rotating the stresses for element 2 from the local to the global system using the stress transformations indicated previously results in:

Element	Node	NX	NY	NXY	MX	MY	MXY
2	2	0	0	0	-31.40	64.73	54.91
	3	0	0	0	-54.91	64.73	31.40
	4	0	0	0	23.51	-23.51	23.51

To obtain the local [P] matrices, the integral

$$\int_v \{N_L\}^T \{\sigma\} \, dv$$

is evaluates. For element No. 1

$$\{\bar{\sigma}\} = \{0\}$$

and therefore,

$$[P_1] = \{0\}.$$

For element No. 2:

$$\{\bar{\sigma}\}^T = \left\{ \begin{array}{l} 0 \\ 0 \\ 0 \\ N_1 \; M_{x2} + N_2 \; M_{x3} + N_3 \; M_{x4} \\ N_1 \; M_{y2} + N_2 \; M_{y3} + N_3 \; M_{y4} \\ N_1 \, M_{xy2} + N_2 \, M_{xy3} + N_3 \, M_{xy4} \end{array} \right\}$$

Separating $\{\bar{\sigma}\}^T$ into two vectors,

$$\{\bar{\sigma}\}_1 = \{0 \quad 0 \quad 0\}$$

$$\{\bar{\sigma}\}_2 = \{N_1 \; N_2 \; N_3\} \begin{bmatrix} M_{x2} & M_{y2} & M_{xy2} \\ M_{x3} & M_{y3} & M_{xy3} \\ M_{x4} & M_{y4} & M_{xy4} \end{bmatrix}$$

$$\{\bar{\sigma}\}_2 = \{N_L\}[M]$$

Evaluating the [P] matrix for element No. 2, the first three columns of $[P_2]$ are

$$\int_v \{N_L\}^T \{\bar{\sigma}\}_1 \, dv = 0$$

The last three columns of $[P_2]$ are

$$\int_v \{N_L\}^T \{\bar{\sigma}\}_2 \, dv$$

or

$$\int_v \{N_L\}^T\{N_L\}[M] \, dv.$$

Observing that [M] is a constant, it will be removed from the integral, resulting in

$$[\int_v\{N_L\}^T\{N_L\} \, dv[M]$$

The integral in this equation is the same integral that has been evaluated for the local [C] matrix of element No. 2. Therefore, the last three columns of $[P]_2$ are $[C_2][M]$.

$$[C_2][M] = \begin{bmatrix} -44.18 & -79.66 & 48.980 \\ +44.92 & 44.92 & 0.017 \\ -79.66 & -55.18 & 48.980 \end{bmatrix}$$

Assembling the [P] matrices from elements 1 and 2 results in the following "force" matrix:

$$[\bar{P}]^T = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & -55.18 & 44.92 & -79.66 \\ 0 & -79.66 & 44.92 & -55.18 \\ 0 & 48.98 & 0.017 & 48.98 \end{bmatrix}$$

Solving the general equation,

$$[\bar{C}][S] = [\bar{P}]$$

for [S], where [S] is the matrix of consistent stresses, results in

$$[S]^T = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 21.60 & -15.71 & 43.15 & -27.46 \\ 21.60 & -27.46 & 43.15 & -15.71 \\ -11.76 & 11.76 & -11.76 & 11.76 \end{bmatrix}$$

In this matrix column 1 entries are the consistent stresses at node 1, column 2 entries are the consistent stresses at node 2, and the final two columns are the consistent stresses at nodes 3 and 4. The stresses are arranged in each column in the following order: N_x, N_y, N_{xy}, M_x, M_y, and M_{xy}.

Example Problem No. 2

Bending Stress Example

A square plate 1 inch thick and 60 inches along a side is subjected to a concentrated load of 100 kips at its center. The plate is clamped along all four edges and restrained against in-plane deformations at each of the interior nodes. The elastic modulus is 29×10^6 psi and the shear modulus is 11.2×10^6 psi.

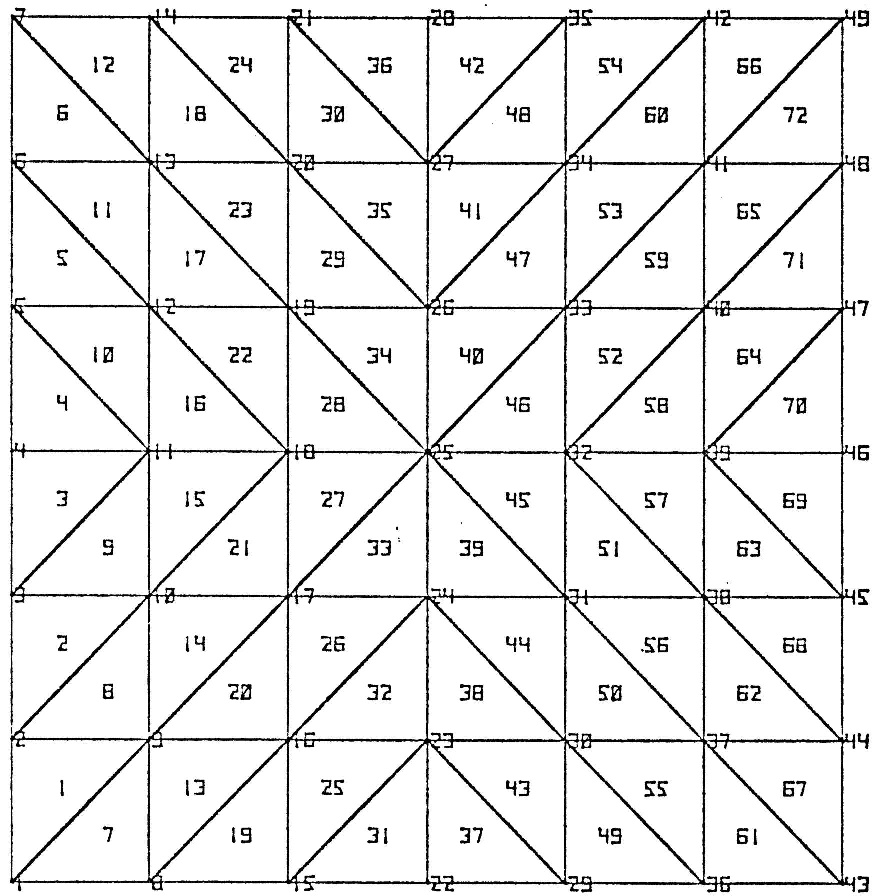
For this system the finite element discretization and numbering sequence is shown in Figure 5 by the computer plot. The system data and computer solution appear in the tabulated data in Appendix B.

A plot of the bending stress resultant M_x versus position along the horizontal centerline is shown in Figure 6. This plot shows the range of the conventional stress candidates and the consistent stress resultants for nodes 4, 11, 18, and 25. At the left face of the plate the consistent stress resultant is 12840 in.-lb/in. and the conventional stress resultant is 13570 in.-lb/in. Comparing these values to the exact solution, given by Timoshenko (4), of 12570 in.-lb/in. the consistent stress resultant compares within 2 percent of the exact value while the conventional stress resultant is in error by more than 7 percent.

Example Problem No. 3

Plane Stress Example

The final example treated is the cantilever wedge under uniform loading, shown in Figure 7 below. Due to a limitation of the computer program, an in-plane uniform load cannot be applied. Instead,



EXAMPLE PROBLEM # 2
SQUARE PLATE ... BENDING STRESS EXAMPLE

Figure 5. Square Plate Mesh Subdivision

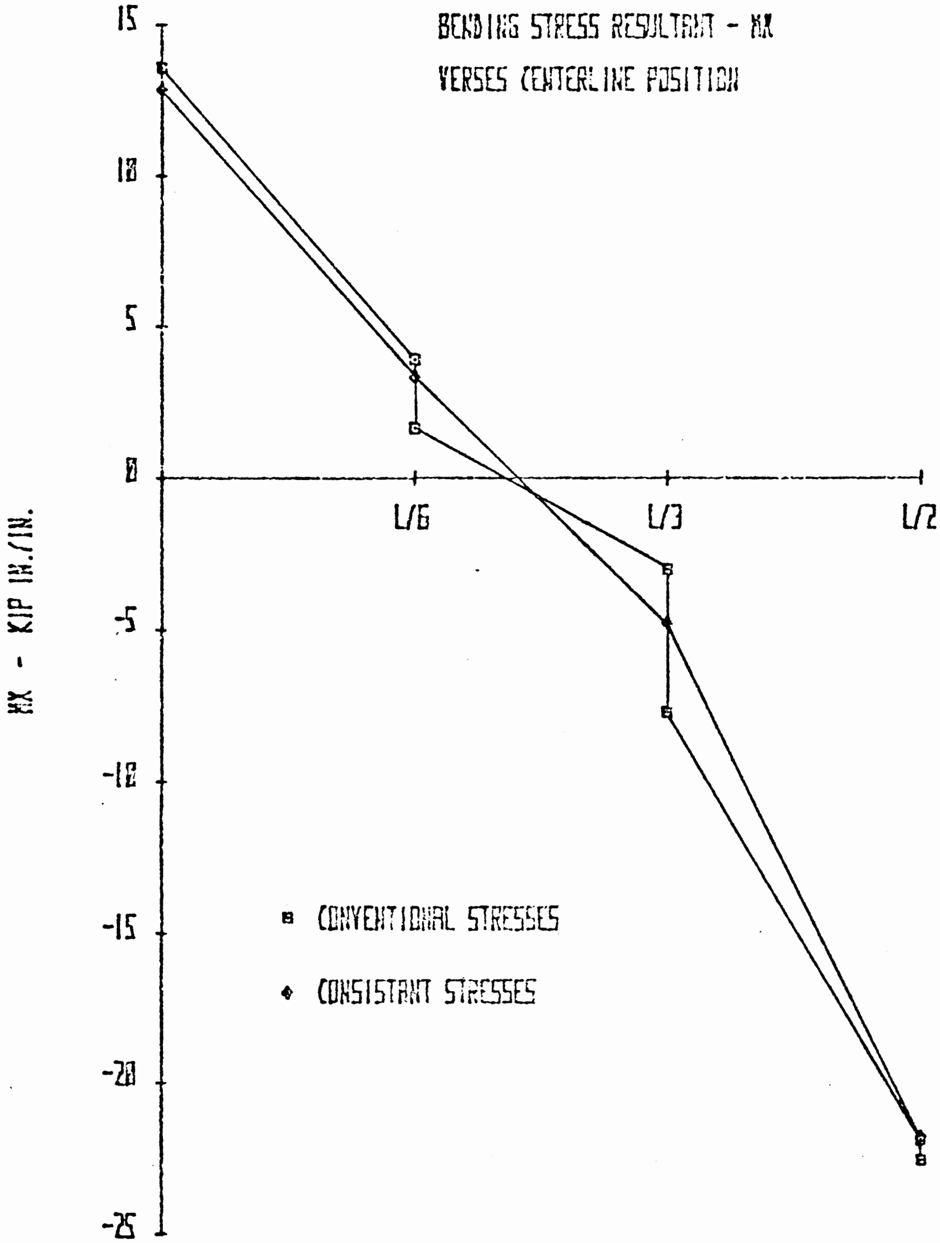


Figure 6. Comparison of Consistent Stresses to Conventional Stresses Along the Plate Centerline

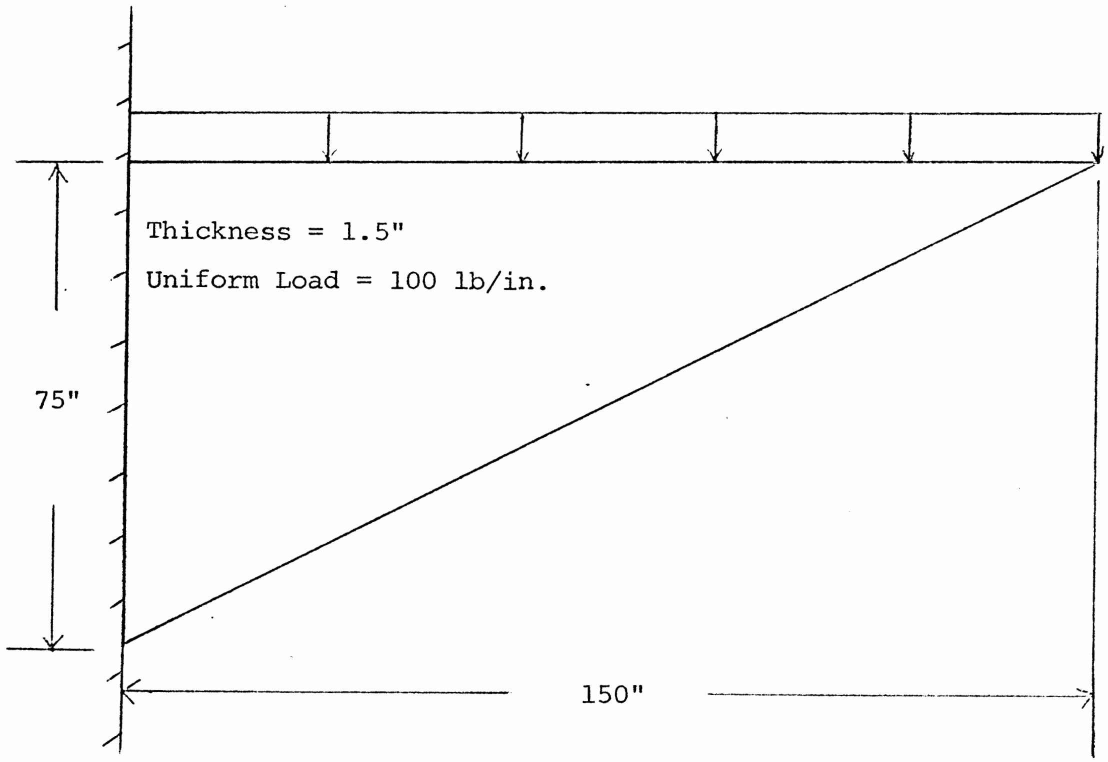


Figure 7. Triangular Plate System

concentrated loads have been applied to the nodes along the top surface to simulate the uniform loading.

For this structure the finite element discretization and numbering sequency is shown in Figure 8. The mesh used in this example displays an added advantage that each vertical line divides the original plate into a substructure shaped exactly like the total structure, allowing accuracy comparison with grid refinement to be established with a single analysis.

The theoretical solution (5) imposes no boundary conditions while the present analysis treats the supported edge as rigidly built-in. This support restraint causes considerable discrepancy in the stresses calculated near the end, but the influence dissipates as expected at some distance away.

In the discussion which follows section A will refer to the vertical plane which intersects node 58. Section B refers to the vertical plane which intersects node 70. Section C refers to the vertical plane intersecting node 81.

Figure 9 shows the variation of the consistent normal stresses across sections A, B, and C, compared with the classical solution, while the same comparisons are made in Figure 10 for the shear stresses. These plots show all three cross sections to be in good agreement with the exact solutions.

Figure 11 shows the variation of the conventional normal stresses from the consistent normal stresses along section A. These conventional stresses display a considerable range, of approximately 800 psi, at many points. This large variation at some points along the cross section gives stress values more than 100 percent in error.

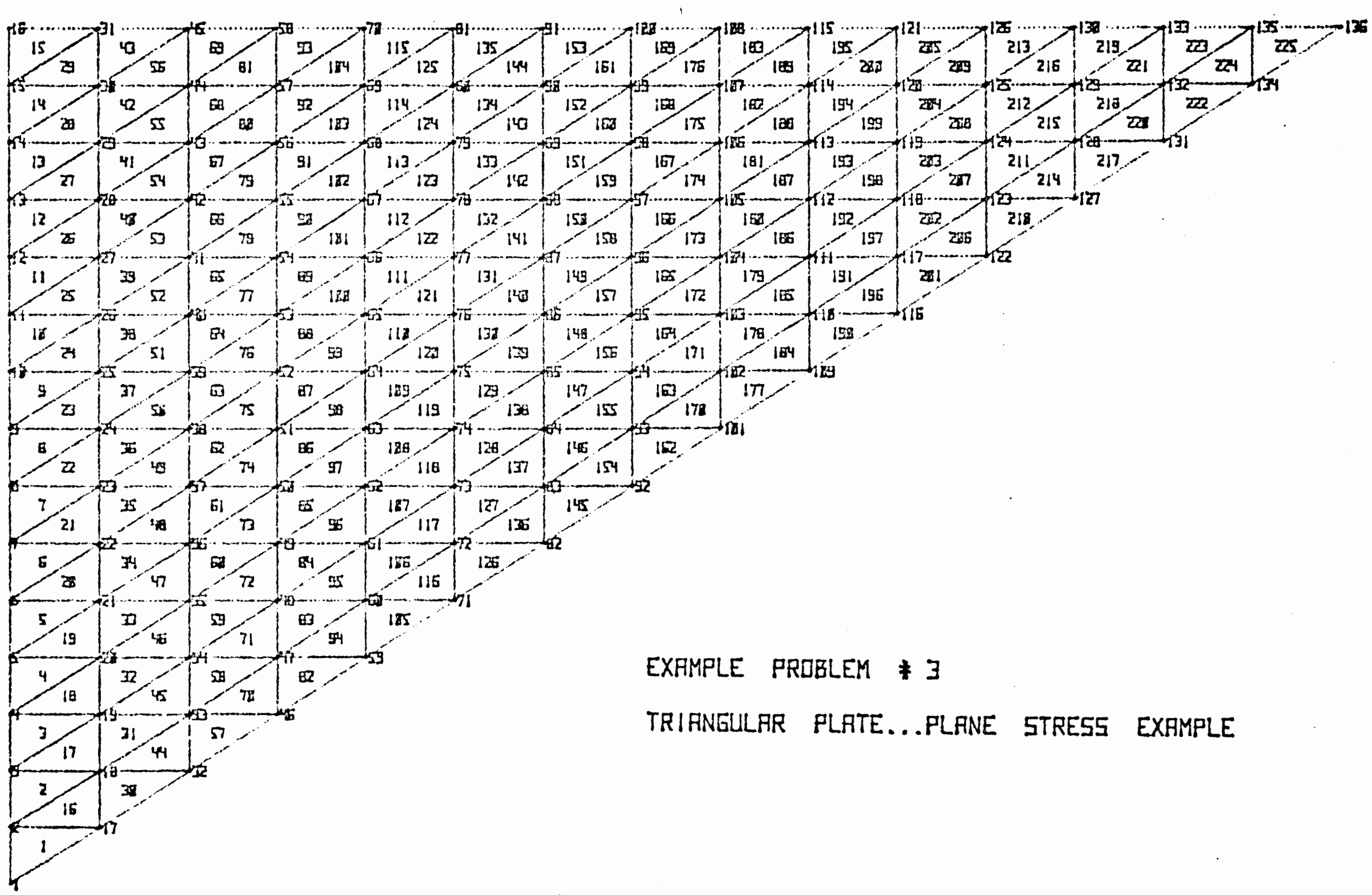


Figure 8. Triangular Plate Mesh Subdivision

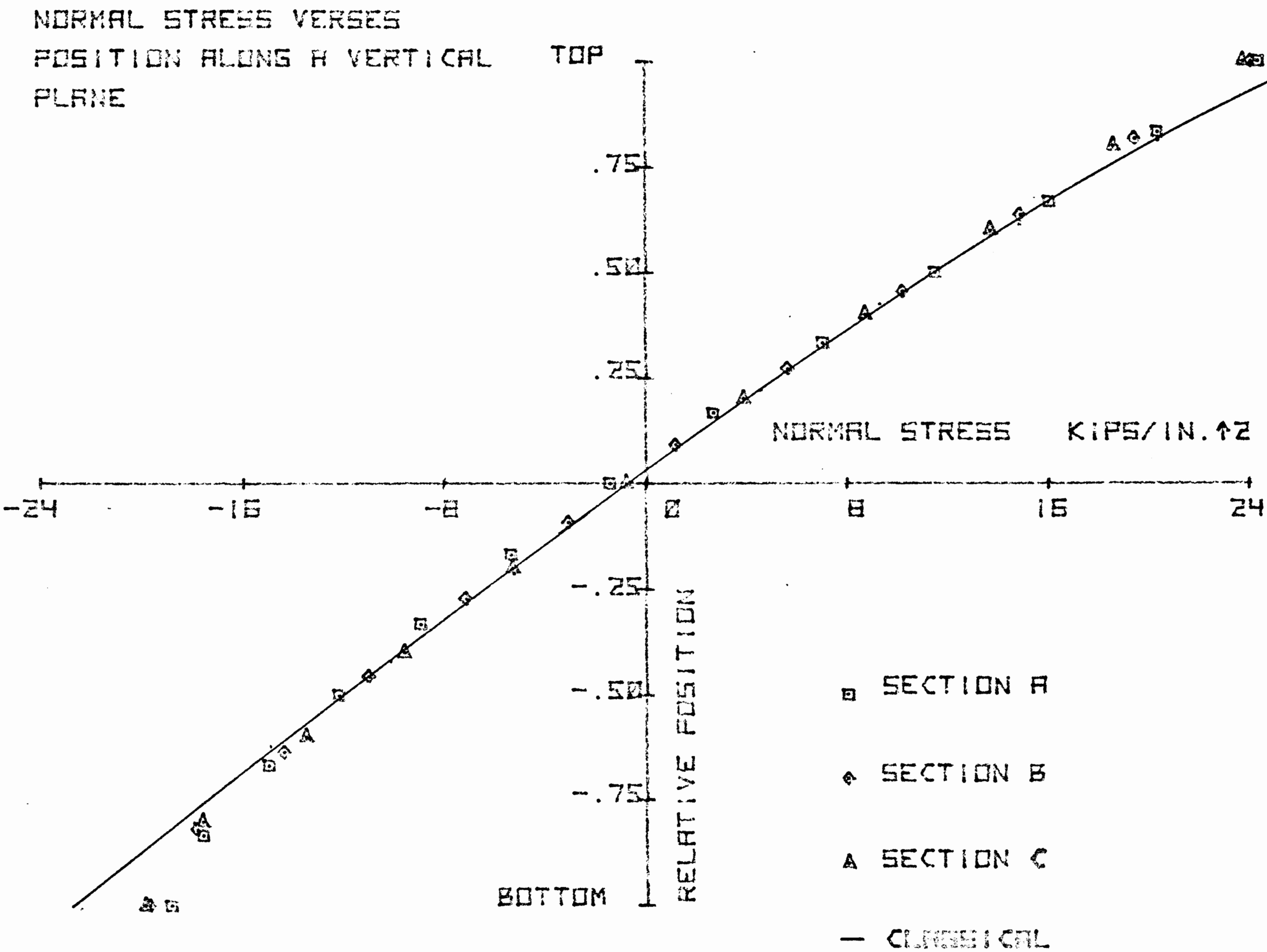


Figure 9. Consistent Normal Stresses σ_x Compared to the Exact Solution

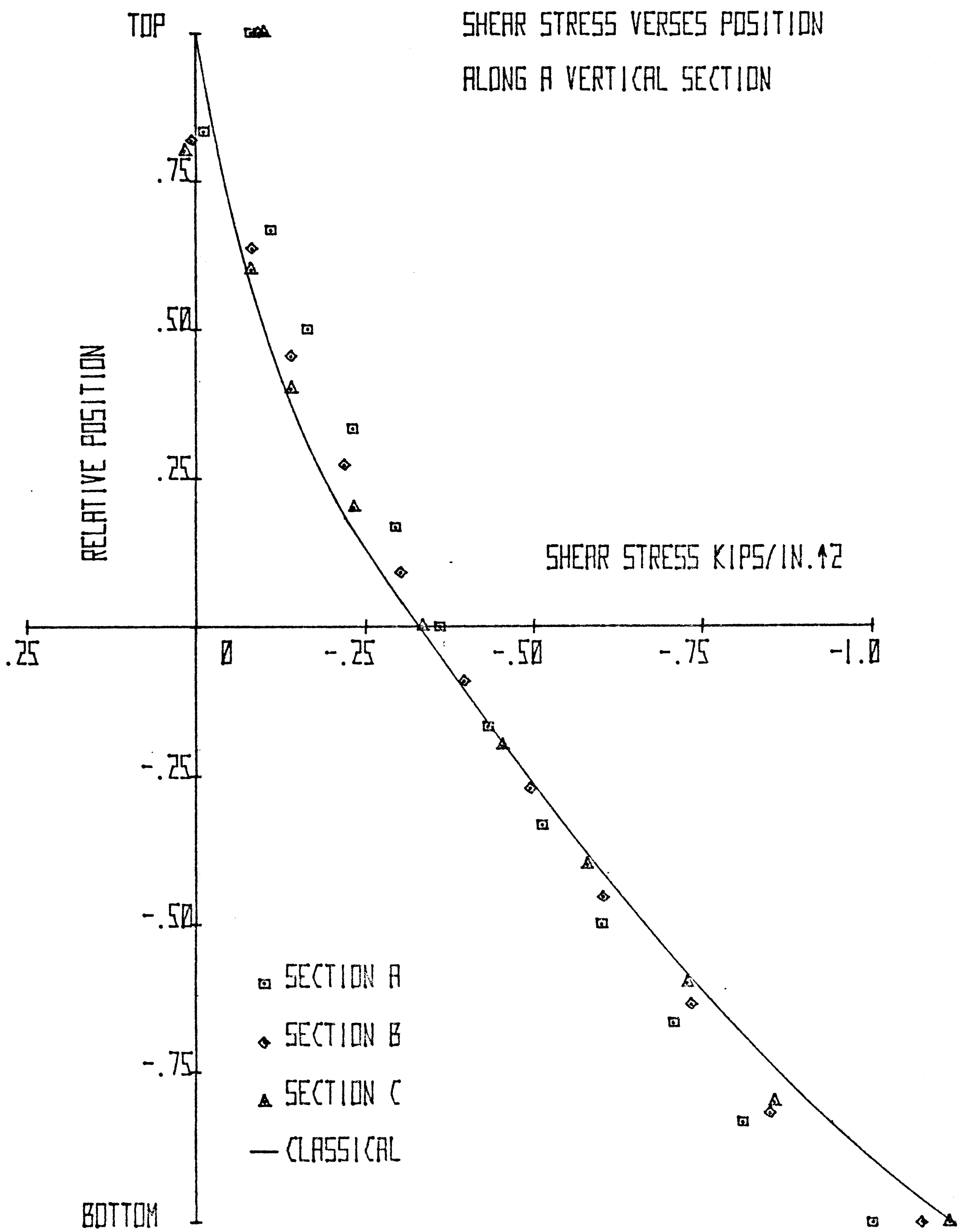


Figure 10. Consistent Shear Stresses τ_{xy} Compared to the Exact Solution

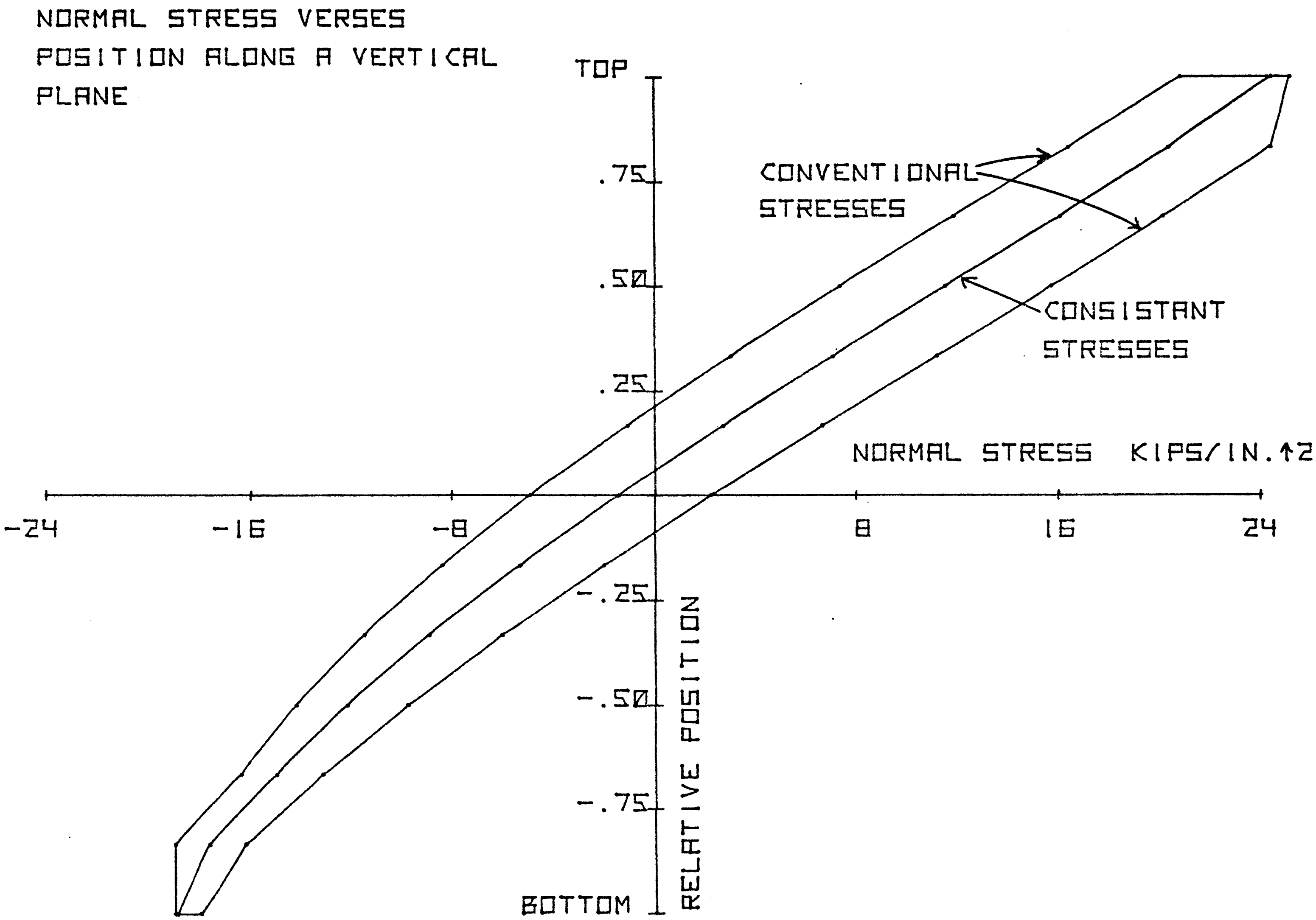


Figure 11. Variation of Conventional Normal Stresses σ_x Compared to the Consistent Normal Stresses

A plot of the same variation for the shear stresses appears in Figure 12. As in the plot for the normal stresses there exist some variations in the conventional values. These variations though are much larger than the variations of the normal stresses, exhibiting differences in upper and lower limits of as much as 1000 psi.

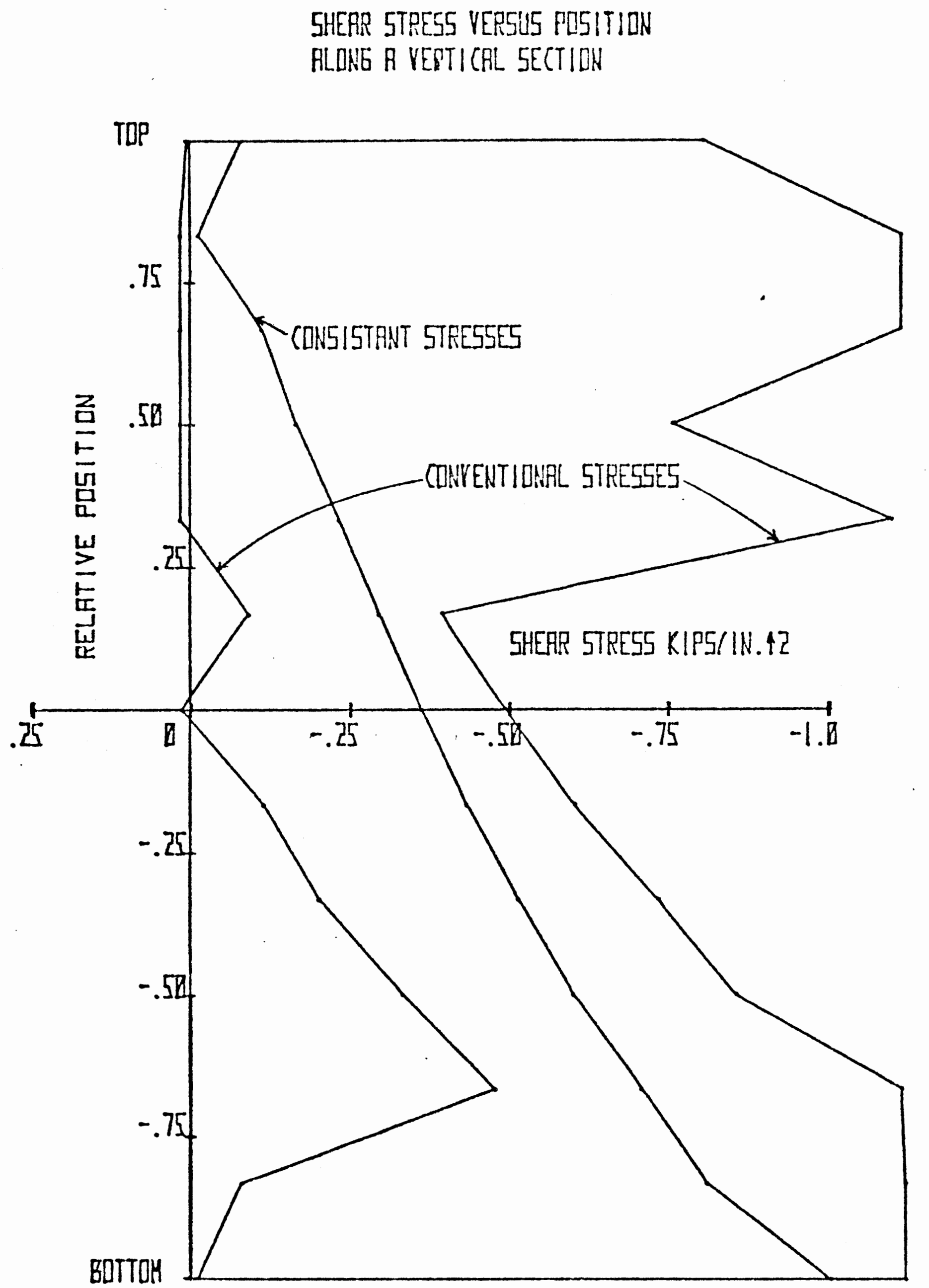


Figure 12. Variation of Conventional Shear Stresses τ_{xy} Compared to the Consistent Shear Stresses

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APPENDIX A

SIMPLE INTEGRATION FORMULAE FOR A TRIANGLE (6)

$$\int x \; dxdy = \; y \; dxdy = 0$$

$$\int dxdy = \frac{1}{2} \begin{vmatrix} 1 & x_i & y_i \\ 1 & x_j & y_j \\ 1 & x_k & y_k \end{vmatrix} = \Delta = \text{area of triangle}$$

$$\int x^2 \; dxdy = \frac{\Delta}{12} \left(x_i^2 + x_j^2 + x_k^2\right)$$

$$\int g^2 \; dxdy = \frac{\Delta}{12} (y_i^2 + y_j^2 + y_k^2$$

$$\int xy \; dxdy = \frac{\Delta}{12} \left(x_i y_i + x_j y_j + x_k y_k\right)$$

APPENDIX B

COMPUTER SOLUTIONS TO EXAMPLE PROBLEMS TWO AND THREE

DATA ECHO PAGE # 1

EXAMPLE PROBLEM # 2
SQUARE PLATE ... BENDING STRESS EXAMPLE

#JOINTS	#MEMBERS	#M.TYPES	#SUPPORTS	#LOAD COND	ELEM'S
49	0	0	49	1	72

SUPPORT RELEASES OCCUR IN THE JOINT SYSTEM

JOINT COORDINATES, UNITS INCHES <----JOINT SUPPORT DATA---->>>

JOINT	-X-	-Y-	-Z-		REL	ALFA	BETA	GAMA
1	0.0000	0.0000	0.0000	S	0	0.0000	0.0000	0.0000
2	0.0000	10.0000	0.0000	S	0	0.0000	0.0000	0.0000
3	0.0000	20.0000	0.0000	S	0	0.0000	0.0000	0.0000
4	0.0000	30.0000	0.0000	S	0	0.0000	0.0000	0.0000
5	0.0000	40.0000	0.0000	S	0	0.0000	0.0000	0.0000
6	0.0000	50.0000	0.0000	S	0	0.0000	0.0000	0.0000
7	0.0000	60.0000	0.0000	S	0	0.0000	0.0000	0.0000
8	10.0000	0.0000	0.0000	S	0	0.0000	0.0000	0.0000
9	10.0000	10.0000	0.0000	S	1110	0.0000	0.0000	0.0000
10	10.0000	20.0000	0.0000	S	1110	0.0000	0.0000	0.0000
11	10.0000	30.0000	0.0000	S	1110	0.0000	0.0000	0.0000
12	10.0000	40.0000	0.0000	S	1110	0.0000	0.0000	0.0000
13	10.0000	50.0000	0.0000	S	1110	0.0000	0.0000	0.0000
14	10.0000	60.0000	0.0000	S	0	0.0000	0.0000	0.0000
15	20.0000	0.0000	0.0000	S	0	0.0000	0.0000	0.0000
16	20.0000	10.0000	0.0000	S	1110	0.0000	0.0000	0.0000
17	20.0000	20.0000	0.0000	S	1110	0.0000	0.0000	0.0000
18	20.0000	30.0000	0.0000	S	1110	0.0000	0.0000	0.0000
19	20.0000	40.0000	0.0000	S	1110	0.0000	0.0000	0.0000
20	20.0000	50.0000	0.0000	S	1110	0.0000	0.0000	0.0000
21	20.0000	60.0000	0.0000	S	0	0.0000	0.0000	0.0000
22	30.0000	0.0000	0.0000	S	0	0.0000	0.0000	0.0000
23	30.0000	10.0000	0.0000	S	1110	0.0000	0.0000	0.0000
24	30.0000	20.0000	0.0000	S	1110	0.0000	0.0000	0.0000
25	30.0000	30.0000	0.0000	S	1110	0.0000	0.0000	0.0000
26	30.0000	40.0000	0.0000	S	1110	0.0000	0.0000	0.0000
27	30.0000	50.0000	0.0000	S	1110	0.0000	0.0000	0.0000
28	30.0000	60.0000	0.0000	S	0	0.0000	0.0000	0.0000
29	40.0000	0.0000	0.0000	S	0	0.0000	0.0000	0.0000
30	40.0000	10.0000	0.0000	S	1110	0.0000	0.0000	0.0000
31	40.0000	20.0000	0.0000	S	1110	0.0000	0.0000	0.0000
32	40.0000	30.0000	0.0000	S	1110	0.0000	0.0000	0.0000
33	40.0000	40.0000	0.0000	S	1110	0.0000	0.0000	0.0000
34	40.0000	50.0000	0.0000	S	1110	0.0000	0.0000	0.0000
35	40.0000	60.0000	0.0000	S	0	0.0000	0.0000	0.0000
36	50.0000	0.0000	0.0000	S	0	0.0000	0.0000	0.0000
37	50.0000	10.0000	0.0000	S	1110	0.0000	0.0000	0.0000
38	50.0000	20.0000	0.0000	S	1110	0.0000	0.0000	0.0000
39	50.0000	30.0000	0.0000	S	1110	0.0000	0.0000	0.0000
40	50.0000	40.0000	0.0000	S	1110	0.0000	0.0000	0.0000
41	50.0000	50.0000	0.0000	S	1110	0.0000	0.0000	0.0000
42	50.0000	60.0000	0.0000	S	0	0.0000	0.0000	0.0000
43	60.0000	0.0000	0.0000	S	0	0.0000	0.0000	0.0000
44	60.0000	10.0000	0.0000	S	0	0.0000	0.0000	0.0000
45	60.0000	20.0000	0.0000	S	0	0.0000	0.0000	0.0000
46	60.0000	30.0000	0.0000	S	0	0.0000	0.0000	0.0000
47	60.0000	40.0000	0.0000	S	0	0.0000	0.0000	0.0000
48	60.0000	50.0000	0.0000	S	0	0.0000	0.0000	0.0000

DATA ECHO

EXAMPLE PROBLEM # 2
SQUARE PLATE ... BENDING STRESS EXAMPLE

JOINT COORDINATES, UNITS INCHES <----JOINT SUPPORT DATA---->>>

JOINT	-X-	-Y-	-Z-		REL	ALFA	BETA	GAMA
49	60.0000	60.0000	0.0000	S	0	0.0000	0.0000	0.0000

FINITE ELEMENT DATA..UNITS INCHES POUNDS DEGREES

ELEM	I	J	K	ALFA	BETA	GAMA	THICK	E	G	X2	X3	Y3
1	9	2	1	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
2	10	3	2	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
3	11	4	3	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
4	4	11	5	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
5	5	12	6	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
6	6	13	7	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
7	1	8	9	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
8	2	9	10	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
9	3	10	11	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
10	12	5	11	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
11	13	6	12	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
12	14	7	13	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
13	16	9	8	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
14	17	10	9	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
15	18	11	10	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
16	11	18	12	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
17	12	19	13	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
18	13	20	14	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
19	8	15	16	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
20	9	16	17	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
21	10	17	18	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
22	19	12	18	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
23	20	13	19	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
24	21	14	20	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
25	23	16	15	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
26	24	17	16	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
27	25	18	17	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
28	18	25	19	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
29	19	26	20	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
30	20	27	21	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
31	15	22	23	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
32	16	23	24	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
33	17	24	25	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
34	26	19	25	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
35	27	20	26	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
36	28	21	27	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
37	22	29	23	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
38	23	30	24	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
39	24	31	25	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
40	33	26	25	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
41	34	27	26	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
42	35	28	27	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
43	30	23	29	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
44	31	24	30	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
45	32	25	31	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
46	25	32	33	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
47	26	33	34	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0

DATA ECHO PAGE # 3

EXAMPLE PROBLEM # 2
SQUARE PLATE ... BENDING STRESS EXAMPLE

FINITE ELEMENT DATA..UNITS INCHES POUNDS DEGREES

ELEM	I	J	K	ALFA	BETA	GAMA	THICK	E	G	X2	X3	Y3
48	27	34	35	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
49	29	36	30	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
50	30	37	31	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
51	31	38	32	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
52	40	33	32	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
53	41	34	33	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
54	42	35	34	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
55	37	30	36	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
56	38	31	37	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
57	39	32	38	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
58	32	39	40	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
59	33	40	41	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
60	34	41	42	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
61	36	43	37	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
62	37	44	38	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
63	38	45	39	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
64	47	40	39	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
65	48	41	40	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
66	49	42	41	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
67	44	37	43	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
68	45	38	44	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
69	46	39	45	180.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	0.0	10.0
70	39	46	47	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
71	40	47	48	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0
72	41	48	49	0.0	0.0	0.0	1.0	2.90E+07	1.12E+07	10.0	10.0	10.0

LOADING UNITS:
LOADS........INCHES POUNDS
TEMPERATURE..FAHRENHEIT
SETTLEMENT...INCHES DEGREES

LOAD CONDITION 1

JT&MBR LOAD	DIM	PX	PY	PZ	MX	MY	MZ
SETTLEMENTS		DX	DY	DZ	0X	0Y	0Z
LIST	25						
JOINT LOADS CON J		0.000	0.000	1.000E+05	0.000	0.000	0.000

OUTPUT PAGE # 4

EXAMPLE PROBLEM # 2
SQUARE PLATE ... BENDING STRESS EXAMPLE

DEFORMATIONS UNITS: INCHES DEGREES

JOINT	LC	DX	DY	DZ	0X	0Y	0Z
1	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
2	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
3	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
4	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
5	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
6	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
7	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
8	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
9	1	0.0000	0.0000	0.0468	0.46027	-0.46027	0.00000
10	1	0.0000	0.0000	0.1398	0.54226	-1.26007	0.00000
11	1	0.0000	0.0000	0.1875	0.00000	-1.75905	0.00000
12	1	0.0000	0.0000	0.1398	-0.54226	-1.26007	0.00000
13	1	0.0000	0.0000	0.0468	-0.46027	-0.46027	0.00000
14	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
15	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
16	1	0.0000	0.0000	0.1398	1.26007	-0.54226	0.00000
17	1	0.0000	0.0000	0.3995	1.35277	-1.35277	0.00000
18	1	0.0000	0.0000	0.5472	0.00000	-2.15811	0.00000
19	1	0.0000	0.0000	0.3995	-1.35277	-1.35277	0.00000
20	1	0.0000	0.0000	0.1398	-1.26007	-0.54226	0.00000
21	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
22	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
23	1	0.0000	0.0000	0.1875	1.75905	0.00000	0.00000
24	1	0.0000	0.0000	0.5472	2.15811	0.00000	0.00000
25	1	0.0000	0.0000	0.7828	0.00000	0.00000	0.00000
26	1	0.0000	0.0000	0.5472	-2.15811	0.00000	0.00000

OUTPUT

EXAMPLE PROBLEM # 2
SQUARE PLATE ... BENDING STRESS EXAMPLE

DEFORMATIONS UNITS: INCHES DEGREES

JOINT	LC	DX	DY	DZ	0X	0Y	0Z
27	1	0.0000	0.0000	0.1875	-1.75905	0.00000	0.00000
28	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
29	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
30	1	0.0000	0.0000	0.1398	1.26007	0.54226	0.00000
31	1	0.0000	0.0000	0.3995	1.35277	1.35277	0.00000
32	1	0.0000	0.0000	0.5472	-0.00000	2.15811	0.00000
33	1	0.0000	0.0000	0.3995	-1.35277	1.35277	0.00000
34	1	0.0000	0.0000	0.1398	-1.26007	0.54226	0.00000
35	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
36	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
37	1	0.0000	0.0000	0.0468	0.46027	0.46027	0.00000
38	1	0.0000	0.0000	0.1398	0.54226	1.26007	0.00000
39	1	0.0000	0.0000	0.1875	-0.00000	1.75905	0.00000
40	1	0.0000	0.0000	0.1398	-0.54226	1.26007	0.00000
41	1	0.0000	0.0000	0.0468	-0.46027	0.46027	0.00000
42	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
43	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
44	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
45	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
46	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
47	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
48	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000
49	1	0.0000	0.0000	0.0000	0.00000	0.00000	0.00000

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
1	1	9	0.000	0.000	0.000	1507.560	1753.770	-2486.150
		2	0.000	0.000	0.000	3188.170	956.471	-500.554
		1	0.000	0.000	0.000	351.604	105.482	500.554

OUTPUT PAGE # 6

EXAMPLE PROBLEM # 2
SQUARE PLATE ... BENDING STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
2	1	10	0.000	0.000	0.000	888.403	-330.799	-3748.540
		3	0.000	0.000	0.000	10595.400	3178.680	229.802
		2	0.000	0.000	0.000	4912.070	1473.640	-229.802
3	1	11	0.000	0.000	0.000	1652.650	-2790.270	-1263.960
		4	0.000	0.000	0.000	13570.200	4071.140	1263.960
		3	0.000	0.000	0.000	9956.940	2987.730	-1263.960
4	1	4	0.000	0.000	0.000	13570.200	4071.140	-1263.960
		11	0.000	0.000	0.000	1652.650	-2790.270	1263.960
		5	0.000	0.000	0.000	9958.940	2987.730	1263.960
5	1	5	0.000	0.000	0.000	10595.400	3178.680	-229.802
		12	0.000	0.000	0.000	888.403	-330.799	3748.530
		6	0.000	0.000	0.000	4912.070	1473.640	229.802
6	1	6	0.000	0.000	0.000	3188.170	956.471	500.554
		13	0.000	0.000	0.000	1507.560	1753.770	2486.140
		7	0.000	0.000	0.000	351.604	105.482	-500.554
7	1	1	0.000	0.000	0.000	105.482	351.604	500.554
		8	0.000	0.000	0.000	956.471	3188.170	-500.554
		9	0.000	0.000	0.000	1753.770	1507.560	-2486.150
8	1	2	0.000	0.000	0.000	3129.110	759.650	-902.035
		9	0.000	0.000	0.000	1456.910	1584.790	-2084.670
		10	0.000	0.000	0.000	2617.760	329.198	-3105.260
9	1	3	0.000	0.000	0.000	10858.500	4055.820	-734.155
		10	0.000	0.000	0.000	349.541	-2127.470	-2784.580
		11	0.000	0.000	0.000	3242.640	-1369.230	-453.304
10	1	12	0.000	0.000	0.000	349.541	-2127.470	2784.590
		5	0.000	0.000	0.000	10858.500	4055.820	734.133
		11	0.000	0.000	0.000	3242.640	-1369.230	453.283
11	1	13	0.000	0.000	0.000	1456.910	1584.790	2084.670
		6	0.000	0.000	0.000	3129.110	759.650	902.026
		12	0.000	0.000	0.000	2617.760	329.198	3105.240
12	1	14	0.000	0.000	0.000	956.471	3188.170	500.554
		7	0.000	0.000	0.000	105.482	351.604	-500.554
		13	0.000	0.000	0.000	1753.770	1507.560	2486.140
13	1	16	0.000	0.000	0.000	329.199	2617.760	-3105.260
		9	0.000	0.000	0.000	1584.730	1456.910	-2084.670
		8	0.000	0.000	0.000	759.649	3129.110	-902.034
14	1	17	0.000	0.000	0.000	-5578.580	-4607.680	-3617.580
		10	0.000	0.000	0.000	5319.960	1139.960	-1541.800
		9	0.000	0.000	0.000	3025.940	2055.480	-3548.130

OUTPUT PAGE # 7

EXAMPLE PROBLEM # 2
SQUARE PLATE ... BENDING STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
15	1	18	0.000	0.030	0.000	-3011.750	-7035.790	161.039
		11	0.000	0.000	0.000	3916.850	-1166.880	-161.036
		10	0.000	0.000	0.000	4412.920	-908.524	-3076.850
16	1	11	0.000	0.000	0.000	3916.850	-1166.880	161.007
		18	0.000	0.000	0.000	-3011.750	-7035.790	-161.007
		12	0.000	0.000	0.000	4412.920	-908.524	3076.870
17	1	12	0.000	0.000	0.000	5319.960	1139.960	1641.780
		19	0.000	0.000	0.000	-5578.580	-4607.680	3617.580
		13	0.000	0.000	0.000	3025.940	2055.480	3548.130
18	1	13	0.000	0.000	0.000	1584.790	1456.910	2084.670
		20	0.000	0.000	0.000	329.199	2617.760	3105.240
		14	0.000	0.000	0.000	759.649	3129.110	902.026
19	1	8	0.000	0.000	0.000	1473.640	4912.070	-229.802
		15	0.000	0.000	0.000	3178.680	10595.400	229.802
		16	0.000	0.000	0.000	-330.797	888.405	-3748.540
20	1	9	0.000	0.000	0.000	2055.488	3025.940	-3548.130
		16	0.000	0.000	0.000	1139.960	5319.950	-1641.800
		17	0.000	0.000	0.000	-4607.680	-5578.580	-3617.580
21	1	10	0.000	0.000	0.000	5076.950	330.172	-2564.510
		17	0.000	0.000	0.000	-5074.350	-2927.910	-2694.870
		18	0.000	0.000	0.000	-7723.520	-12323.200	-2531.300
22	1	19	0.000	0.000	0.000	-5074.350	-2927.910	2694.870
		12	0.000	0.000	0.000	5076.950	330.172	2564.500
		18	0.000	0.000	0.000	-7723.520	-12323.200	2530.980
23	1	20	0.000	0.000	0.000	1139.960	5319.950	1641.790
		13	0.000	0.000	0.000	2055.480	3025.940	3548.130
		19	0.000	0.000	0.000	-4607.680	-5578.580	3617.580
24	1	21	0.000	0.000	0.000	3178.680	10595.400	-229.802
		14	0.000	0.000	0.000	1473.640	4912.070	229.802
		20	0.000	0.000	0.000	-330.797	888.405	3748.530
25	1	23	0.000	0.000	0.000	-1369.230	3242.640	-453.304
		16	0.000	0.000	0.000	-2127.470	349.542	-2784.580
		15	0.000	0.000	0.000	4055.820	10858.500	-734.155
26	1	24	0.000	0.000	0.000	-12323.200	-7723.530	-2531.000
		17	0.000	0.000	0.000	-2927.910	-5074.350	-2694.870
		16	0.000	0.000	0.000	330.169	5076.950	-2564.510
27	1	25	0.000	0.000	0.000	-22528.600	-21870.800	648.988
		18	0.000	0.000	0.000	-5758.160	-11733.300	-648.988
		17	0.000	0.000	0.000	-1069.130	-1726.540	-4576.880

OUTPUT

PAGE # 8

EXAMPLE PROBLEM # 2
SQUARE PLATE ... BENDING STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
28	1	18	0.000	0.000	0.000	-5758.160	-11733.300	648.951
		25	0.000	0.000	0.000	-22528.600	-21870.800	-648.951
		19	0.000	0.000	0.000	-1069.130	-1726.540	4576.900
29	1	19	0.000	0.000	0.000	-2927.910	-5074.350	2594.870
		26	0.000	0.000	0.000	-12323.200	-7723.530	2530.990
		20	0.000	0.000	0.000	330.163	5076.950	2544.500
30	1	20	0.000	0.000	0.000	-2127.470	349.542	2784.590
		27	0.000	0.000	0.000	-1369.230	3242.640	453.282
		21	0.000	0.000	0.000	4055.820	10858.500	734.133
31	1	15	0.000	0.000	0.000	2987.730	9958.940	-1263.960
		22	0.000	0.000	0.000	4071.150	13570.200	1263.960
		23	0.000	0.000	0.000	-2790.270	1652.650	-1263.960
32	1	16	0.000	0.000	0.000	-908.525	4412.920	-3076.850
		23	0.000	0.000	0.000	-1166.880	3916.850	-161.038
		24	0.000	0.000	0.000	-7035.780	-3011.740	161.038
33	1	17	0.000	0.000	0.000	-1726.530	-1069.130	-4576.880
		24	0.000	0.000	0.000	-11733.300	-5758.180	-648.993
		25	0.000	0.000	0.000	-21870.800	-22528.600	648.993
34	1	26	0.000	0.000	0.000	-11733.300	-5758.180	648.955
		19	0.000	0.000	0.000	-1726.530	-1069.130	4576.900
		25	0.000	0.000	0.000	-21870.800	-22528.600	-648.955
35	1	27	0.000	0.000	0.000	-1166.880	3916.850	161.038
		20	0.000	0.000	0.000	-908.525	4412.920	3075.870
		26	0.000	0.000	0.000	-7035.780	-3011.740	-161.008
36	1	28	0.000	0.000	0.000	4071.150	13570.200	-1263.960
		21	0.000	0.000	0.000	2987.730	9958.940	1263.960
		27	0.000	0.000	0.000	-2790.270	1652.650	1263.960
37	1	22	0.000	0.000	0.000	4071.150	13570.200	-1263.960
		29	0.000	0.000	0.000	2987.730	9958.940	1263.960
		23	0.000	0.000	0.000	-2790.270	1652.650	1263.960
38	1	23	0.000	0.000	0.000	-1166.880	3916.850	161.008
		30	0.000	0.000	0.000	-908.525	4412.920	3076.870
		24	0.000	0.000	0.000	-7035.780	-3011.740	-161.008
39	1	24	0.000	0.000	0.000	-11733.300	-5758.180	648.955
		31	0.000	0.000	0.000	-1726.530	-1069.130	4576.900
		25	0.000	0.000	0.000	-21870.800	-22528.600	-648.955
40	1	33	0.000	0.000	0.000	-1726.530	-1069.130	-4576.880
		26	0.000	0.000	0.000	-11733.300	-5758.180	-648.993
		25	0.000	0.000	0.000	-21870.800	-22528.600	648.993

OUTPUT

PAGE # 9

EXAMPLE PROBLEM # 2
SQUARE PLATE ... BENDING STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
41	1	34	0.000	0.000	0.000	-908.525	4412.920	-3076.250
		27	0.000	0.000	0.000	-1166.880	3916.850	-161.022
		26	0.000	0.000	0.000	-7035.780	-3011.740	161.038
42	1	35	0.000	0.000	0.000	2987.730	9958.940	-1263.950
		28	0.000	0.000	0.000	4071.150	13570.200	1263.960
		27	0.000	0.000	0.000	-2790.270	1652.650	-1263.960
43	1	30	0.000	0.000	0.000	-2127.470	349.542	2784.590
		23	0.000	0.000	0.000	-1369.230	3242.640	453.282
		29	0.000	0.000	0.000	4055.820	10858.500	734.133
44	1	31	0.000	0.000	0.000	-2927.910	-5074.350	2694.870
		24	0.000	0.000	0.000	-12323.200	-7723.530	2530.970
		30	0.000	0.000	0.000	330.169	5076.950	2564.500
45	1	32	0.000	0.000	0.000	-5758.160	-11733.300	648.951
		25	0.000	0.000	0.000	-22528.600	-21870.800	-648.951
		31	0.000	0.000	0.000	-1069.130	-1726.540	4576.900
46	1	25	0.000	0.000	0.000	-22528.600	-21870.800	648.988
		32	0.000	0.000	0.000	-5758.160	-11733.300	-648.988
		33	0.000	0.000	0.000	-1069.130	-1726.540	-4576.883
47	1	26	0.000	0.000	0.000	-12323.200	-7723.530	-2531.000
		33	0.000	0.000	0.000	-2927.910	-5074.350	-2694.870
		34	0.000	0.000	0.000	330.169	5076.950	-2564.510
48	1	27	0.000	0.000	0.000	-1369.230	3242.640	-453.304
		34	0.000	0.000	0.000	-2127.470	349.542	-2784.580
		35	0.000	0.000	0.000	4055.820	10858.500	-734.155
49	1	29	0.000	0.000	0.000	3178.680	10595.400	-229.802
		36	0.000	0.000	0.000	1473.640	4912.070	229.802
		30	0.000	0.000	0.000	-330.797	888.405	3748.530
50	1	30	0.000	0.000	0.000	1139.960	5319.950	1641.790
		37	0.000	0.000	0.000	2055.480	3025.940	3548.130
		31	0.000	0.000	0.000	-4607.680	-5578.580	3617.580
51	1	31	0.000	0.000	0.000	-5074.350	-2927.910	2694.870
		38	0.000	0.000	0.000	5076.950	330.172	2564.500
		32	0.000	0.000	0.000	-7723.520	-12323.200	2530.980
52	1	40	0.000	0.000	0.000	5076.950	330.172	-2564.510
		33	0.000	0.000	0.000	-5074.350	-2927.910	-2694.870
		32	0.000	0.000	0.000	-7723.520	-12323.200	-2531.000
53	1	41	0.000	0.000	0.000	2055.480	3025.940	-3548.130
		34	0.000	0.000	0.000	1139.960	5319.950	-1641.800
		33	0.000	0.000	0.000	-4607.680	-5578.580	-3617.590

OUTPUT

EXAMPLE PROBLEM # 2
SQUARE PLATE ... BENDING STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
54	1	42	0.000	0.000	0.000	1473.640	4912.070	-229.802
		35	0.000	0.000	0.000	3178.680	10595.400	229.802
		34	0.000	0.000	0.000	-330.797	888.405	-3748.540
55	1	37	0.000	0.000	0.000	1584.790	1456.910	2084.670
		30	0.000	0.000	0.000	329.199	2617.760	3105.240
		36	0.000	0.000	0.000	759.649	3129.110	902.026
56	1	38	0.000	0.000	0.000	5319.960	1139.960	1641.780
		31	0.000	0.000	0.000	-5578.580	-4607.680	3617.580
		37	0.000	0.000	0.000	3025.940	2055.480	3548.130
57	1	39	0.000	0.000	0.000	3916.850	-1166.880	161.037
		32	0.000	0.000	0.000	-3011.750	-7035.790	-161.097
		38	0.000	0.000	0.000	4412.920	-908.524	3076.870
58	1	32	0.000	0.000	0.000	-3011.750	-7035.790	161.038
		39	0.000	0.000	0.000	3916.850	-1166.880	-161.038
		40	0.000	0.000	0.000	4412.920	-908.524	-3076.850
59	1	33	0.000	0.000	0.000	-5578.590	-4607.680	-3617.590
		40	0.000	0.000	0.000	5319.960	1139.960	-1641.800
		41	0.000	0.000	0.000	3025.940	2055.480	-3548.130
60	1	34	0.000	0.000	0.000	329.199	2617.760	-3105.260
		41	0.000	0.000	0.000	1584.790	1456.910	-2084.670
		42	0.000	0.000	0.000	759.649	3129.110	-902.034
61	1	36	0.000	0.000	0.000	956.471	3188.170	500.554
		43	0.000	0.000	0.000	105.482	351.604	-500.554
		37	0.000	0.000	0.000	1753.770	1507.560	2486.140
62	1	37	0.000	0.000	0.000	1456.910	1584.790	2084.670
		44	0.000	0.000	0.000	3129.110	759.650	902.025
		38	0.000	0.000	0.000	2617.760	329.198	3105.240
63	1	38	0.000	0.000	0.000	349.541	-2127.470	2794.590
		45	0.000	0.000	0.000	10858.500	4055.820	734.133
		39	0.000	0.000	0.000	3242.640	-1369.230	453.283
64	1	47	0.000	0.000	0.000	10858.500	4055.820	-734.155
		40	0.000	0.000	0.000	349.541	-2127.470	-2784.580
		39	0.000	0.000	0.000	3242.640	-1369.230	-453.304
65	1	48	0.000	0.000	0.000	3129.110	759.650	-902.035
		41	0.000	0.000	0.000	1456.910	1584.790	-2084.670
		40	0.000	0.000	0.000	2617.760	329.198	-3105.260
66	1	49	0.000	0.000	0.000	105.452	351.604	500.554
		42	0.000	0.000	0.000	956.471	3188.170	-500.554
		41	0.000	0.000	0.000	1753.770	1507.560	-2486.150

OUTPUT PAGE # 11

EXAMPLE PROBLEM # 2
SQUARE PLATE ... BENDING STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
67	1	44	0.000	0.000	0.000	3188.170	956.471	500.554
		37	0.000	0.000	0.000	1507.560	1753.770	2486.140
		43	0.000	0.000	0.000	351.604	105.482	-500.554
68	1	45	0.000	0.000	0.000	10595.400	3178.680	-229.802
		38	0.000	0.000	0.000	888.403	-330.799	.3748.530
		44	0.000	0.000	0.000	4912.070	1473.640	229.802
69	1	46	0.000	0.000	0.000	13570.200	4071.140	-1263.960
		39	0.000	0.000	0.000	1652.650	-2790.270	1263.960
		45	0.000	0.000	0.000	9958.940	2987.730	1263.960
70	1	39	0.000	0.000	0.000	1652.650	-2790.270	-1263.960
		46	0.000	0.000	0.000	13570.200	4071.140	1263.960
		47	0.000	0.000	0.000	9958.940	2987.730	-1263.960
71	1	40	0.000	0.000	0.000	888.403	-330.799	-3748.540
		47	0.000	0.000	0.000	10595.400	3178.680	229.802
		48	0.000	0.000	0.000	4912.070	1473.640	-229.802
72	1	41	0.000	0.000	0.000	1507.560	1753.770	-2486.150
		48	0.000	0.000	0.000	3188.170	956.471	-500.554
		49	0.000	0.000	0.000	351.604	105.482	500.554

REACTIONS AT SUPPORTS UNITS: INCHES POUNDS

JOINT	LC	PX	PY	PZ	MX	MY	MZ
1	1	0.000	0.000	711.124	-4915.330	4915.340	0.000
2	1	0.000	0.000	-1428.410	-20006.304	26981.260	0.000
3	1	0.000	0.000	-9543.300	-33713.830	88961.300	0.000
4	1	0.000	0.000	-3767.680	0.000	116715.000	0.000
5	1	0.000	0.000	-9543.300	33713.830	88961.300	0.000
6	1	0.000	0.000	-1428.410	20006.304	26981.260	0.000
7	1	0.000	0.000	711.124	4915.330	4915.340	0.000
8	1	0.000	0.000	-1428.410	-26981.250	20006.313	0.000
9	1	0.000	0.000	0.005	0.066	-0.080	0.000
10	1	0.000	0.000	0.000	0.010	0.030	0.000
11	1	0.000	0.000	0.000	0.000	0.080	0.000

OUTPUT PAGE # 12

EXAMPLE PROBLEM # 2
SQUARE PLATE ... BENDING STRESS EXAMPLE

REACTIONS AT SUPPORTS UNITS: INCHES POUNDS

JOINT	LC	PX	PY	PZ	MX	MY	MZ
12	1	0.000	0.000	0.000	-0.010	0.030	0.000
13	1	0.000	0.000	0.005	-0.066	-0.080	0.000
14	1	0.000	0.000	-1428.410	26981.280	20006.313	0.000
15	1	0.000	0.000	-9543.290	-88961.300	33713.740	0.000
16	1	0.000	0.000	-0.007	0.070	-0.020	0.000
17	1	0.000	0.000	0.006	0.000	-0.010	0.000
18	1	0.000	0.000	0.060	0.000	-0.100	0.000
19	1	0.000	0.000	0.006	0.000	0.090	0.000
20	1	0.000	0.000	-0.007	-0.070	-0.020	0.000
21	1	0.000	0.000	-9543.290	88961.300	33713.740	0.000
22	1	0.000	0.000	-3767.680	-116715.000	0.000	0.000
23	1	0.000	0.000	0.020	-0.060	0.000	0.000
24	1	0.000	0.000	0.040	0.080	0.000	0.000
25	1	0.000	0.000	-0.400	0.000	0.000	0.000
26	1	0.000	0.000	0.040	-0.080	0.000	0.000
27	1	0.000	0.000	0.020	0.060	0.000	0.000
28	1	0.000	0.000	-3767.680	116715.000	0.000	0.000
29	1	0.000	0.000	-9543.290	-88961.300	-33713.740	0.000
30	1	0.000	0.000	-0.007	0.070	0.020	0.000
31	1	0.000	0.000	0.006	0.000	0.010	0.000
32	1	0.000	0.000	0.060	0.000	0.100	0.000
33	1	0.000	0.000	0.006	0.000	0.010	0.000
34	1	0.000	0.000	-0.007	-0.070	0.020	0.000
35	1	0.000	0.000	-9543.290	88961.300	-33713.740	0.000
36	1	0.000	0.000	-1428.410	-26981.280	-20006.313	0.000
37	1	0.000	0.000	0.005	0.066	0.080	0.000

OUTPUT PAGE # 13

EXAMPLE PROBLEM # 2
SQUARE PLATE ... BENDING STRESS EXAMPLE

REACTIONS AT SUPPORTS UNITS: INCHES POUNDS

JOINT	LC	PX	PY	PZ	MX	MY	MZ
38	1	0.000	0.000	0.000	0.010	-0.030	0.000
39	1	0.000	0.000	0.000	0.000	-0.080	0.000
40	1	0.000	0.000	0.000	-0.010	-0.030	0.000
41	1	0.000	0.000	0.005	-0.066	0.080	0.000
42	1	0.000	0.000	-1428.410	26981.280	-20006.313	0.000
43	1	0.000	0.000	711.124	-4915.330	-4915.340	0.000
44	1	0.000	0.000	-1428.410	-20006.304	-26981.260	0.000
45	1	0.000	0.000	-9543.300	-33713.830	-88961.300	0.000
46	1	0.000	0.000	-3767.680	0.000	-116715.000	0.000
47	1	0.000	0.000	-9543.300	33713.830	-88961.300	0.000
48	1	0.000	0.000	-1428.410	20006.304	-26981.260	0.000
49	1	0.000	0.000	711.124	4915.330	-4915.340	0.000

SUM OF ALL REACTIONS

	LC	PX	PY	PZ	MX	MY	MZ
	1	0.000	0.000	-100000.008	0.000	0.100	0.000

AVERAGE UNIT MOMENTS AT JOINTS ... UNITS.. IN LB/IN

JNT	LC#	NX	NY	NXY	MX	MY	MXY
1	1	0.000	0.000	0.000	23.726	23.726	516.050
2	1	0.000	0.000	0.000	3348.551	1059.523	-466.198
3	1	0.000	0.000	0.000	9724.844	3013.065	-742.348
4	1	0.000	0.000	0.000	12843.341	3403.114	0.004
5	1	0.000	0.000	0.000	9724.844	3013.065	742.341
6	1	0.000	0.000	0.000	3348.551	1059.523	466.194
7	1	0.000	0.000	0.000	23.726	23.726	-516.049
8	1	0.000	0.000	0.000	1059.524	3348.551	-466.198
9	1	0.000	0.000	0.000	1908.582	1908.581	-2551.499
10	1	0.000	0.000	0.000	3109.649	-105.226	-2916.281
11	1	0.000	0.000	0.000	3340.464	-1479.554	-0.004
12	1	0.000	0.000	0.000	3109.649	-105.226	2916.275
13	1	0.000	0.000	0.000	1908.582	1908.581	2551.491
14	1	0.000	0.000	-0.000	1059.524	3348.551	466.190
15	1	0.000	0.000	0.000	3013.066	9724.844	-742.348
16	1	0.000	0.000	0.000	-105.227	3109.649	-2916.281
17	1	0.000	0.000	0.000	-3647.711	-3647.714	-3946.675
18	1	0.000	0.000	0.000	-4792.481	-9951.325	-0.002
19	1	0.000	0.000	0.000	-3647.711	-3647.714	3946.674
20	1	0.000	0.000	0.000	-105.227	3109.649	2916.278
21	1	0.000	0.000	0.000	3013.066	9724.844	742.340
22	1	0.000	0.000	0.000	3403.123	12843.339	0.004
23	1	0.000	0.000	0.000	-1479.552	3340.467	-0.004
24	1	0.000	0.000	0.000	-9951.322	-4792.487	-0.001
25	1	0.000	0.000	0.000	-21761.678	-21761.678	0.015
26	1	0.000	0.000	0.000	-9951.322	-4792.487	-0.001
27	1	0.000	0.000	0.000	-1479.552	3340.467	-0.004
28	1	0.000	0.000	0.000	3403.123	12843.339	0.004
29	1	0.000	0.000	0.000	3013.066	9724.844	742.340

AVERAGE UNIT MOMENTS AT JOINTS ... UNITS.. IN LB/IN

JNT	LC#	NX	NY	NXY	MX	MY	MXY
30	1	0.000	0.000	0.000	-105.227	3109.649	2916.278
31	1	0.000	0.000	0.000	-3647.711	-3647.714	3946.674
32	1	0.000	0.000	0.000	-4792.481	-9951.325	-0.002
33	1	0.000	0.000	0.000	-3647.711	-3647.714	-3946.675
34	1	0.000	0.000	0.000	-105.227	3109.649	-2916.281
35	1	0.000	0.000	0.000	3013.066	9724.844	-742.348
36	1	0.000	0.000	0.000	1059.524	3348.551	466.193
37	1	0.000	0.000	0.000	1908.582	1908.581	2551.491
38	1	0.000	0.000	0.000	3109.649	-105.226	2916.275
39	1	0.000	0.000	0.000	3340.464	-1479.554	-0.004
40	1	0.000	0.000	0.000	3109.649	-105.226	-2916.281
41	1	0.000	0.000	0.000	1908.582	1908.581	-2551.499
42	1	0.000	0.000	0.000	1059.524	3348.551	-466.198
43	1	0.000	0.000	0.000	23.726	23.726	-515.049
44	1	0.000	0.000	0.000	3348.551	1059.523	466.194
45	1	0.000	0.000	0.000	9724.844	3013.065	742.341
46	1	0.000	0.000	0.000	12843.341	3403.114	0.004
47	1	0.000	0.000	0.000	9724.844	3013.065	-742.348
48	1	0.000	0.000	0.000	3348.551	1059.523	-466.198
49	1	0.000	0.000	0.000	23.726	23.726	516.050

OUTPUT

PAGE # 1

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
1	1	17	-739.267	-221.767	-323.176	0.000	0.000	0.000
		2	-739.267	-221.767	-323.176	0.000	0.000	0.000
		1	-739.267	-221.767	-323.176	0.000	0.000	0.000
2	1	18	-762.653	-228.783	-310.620	0.000	0.000	0.000
		3	-762.653	-228.783	-310.620	0.000	0.000	0.000
		2	-762.653	-228.783	-310.620	0.000	0.000	0.000
3	1	19	-739.522	-221.844	-292.284	0.000	0.000	0.000
		4	-739.522	-221.844	-292.284	0.000	0.000	0.000
		3	-739.522	-221.844	-292.284	0.000	0.000	0.000
4	1	20	-677.668	-203.289	-271.484	0.000	0.000	0.000
		5	-677.668	-203.289	-271.484	0.000	0.000	0.000
		4	-677.668	-203.289	-271.484	0.000	0.000	0.000
5	1	21	-583.732	-175.109	-250.638	0.000	0.000	0.000
		6	-583.732	-175.109	-250.638	0.000	0.000	0.000
		5	-583.732	-175.109	-250.638	0.000	0.000	0.000
6	1	22	-462.824	-138.839	-231.584	0.000	0.000	0.000
		7	-462.824	-138.839	-231.584	0.000	0.000	0.000
		6	-462.824	-138.839	-231.584	0.000	0.000	0.000
7	1	23	-318.730	-95.614	-215.824	0.000	0.000	0.000
		8	-318.730	-95.614	-215.824	0.000	0.000	0.000
		7	-318.730	-95.614	-215.824	0.000	0.000	0.000
8	1	24	-154.152	-46.243	-204.699	0.000	0.000	0.000
		9	-154.152	-46.243	-204.699	0.000	0.000	0.000
		8	-154.152	-46.243	-204.699	0.000	0.000	0.000
9	1	25	29.176	8.752	-199.542	0.000	0.000	0.000
		10	29.176	8.752	-199.542	0.000	0.000	0.000
		9	29.176	8.752	-199.542	0.000	0.000	0.000
10	1	26	230.560	69.164	-201.810	0.000	0.000	0.000
		11	230.560	69.164	-201.810	0.000	0.000	0.000
		10	230.560	69.164	-201.810	0.000	0.000	0.000
11	1	27	450.729	135.211	-213.252	0.000	0.000	0.000
		12	450.729	135.211	-213.252	0.000	0.000	0.000
		11	450.729	135.211	-213.252	0.000	0.000	0.000
12	1	28	692.857	207.845	-236.110	0.000	0.000	0.000
		13	692.857	207.845	-236.110	0.000	0.000	0.000
		12	692.857	207.845	-236.110	0.000	0.000	0.000

PAGE # 2

OUTPUT

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
13	1	29	965.119	289.519	-273.392	0.000	0.000	0.000
		14	965.119	289.519	-273.392	0.000	0.000	0.000
		13	965.119	289.519	-273.392	0.000	0.000	0.000
14	1	30	1287.420	386.204	-329.127	0.000	0.000	0.000
		15	1287.420	386.204	-329.127	0.000	0.000	0.000
		14	1287.420	386.204	-329.127	0.000	0.000	0.000
15	1	31	1710.930	513.252	-408.096	0.000	0.000	0.000
		16	1710.930	513.252	-408.096	0.000	0.000	0.000
		15	1710.930	513.252	-408.096	0.000	0.000	0.000
16	1	2	-717.745	-150.022	-339.546	0.000	0.000	0.000
		17	-717.745	-150.022	-339.546	0.000	0.000	0.000
		18	-717.745	-150.022	-339.546	0.000	0.000	0.000
17	1	3	-731.223	-124.010	-294.428	0.000	0.000	0.000
		18	-731.223	-124.010	-294.428	0.000	0.000	0.000
		19	-731.223	-124.010	-294.428	0.000	0.000	0.000
18	1	4	-703.867	-102.988	-248.986	0.000	0.000	0.000
		19	-703.867	-102.988	-248.986	0.000	0.000	0.000
		20	-703.867	-102.988	-248.986	0.000	0.000	0.000
19	1	5	-641.935	-84.170	-205.727	0.000	0.000	0.000
		20	-641.935	-84.170	-205.727	0.000	0.000	0.000
		21	-641.935	-84.170	-205.727	0.000	0.000	0.000
20	1	6	-551.072	-66.235	-165.999	0.000	0.000	0.000
		21	-551.072	-66.235	-165.999	0.000	0.000	0.000
		22	-551.072	-66.235	-165.999	0.000	0.000	0.000
21	1	7	-435.809	-48.783	-130.716	0.000	0.000	0.000
		22	-435.809	-48.783	-130.716	0.000	0.000	0.000
		23	-435.809	-48.783	-130.716	0.000	0.000	0.000
22	1	8	-299.661	-32.047	-100.616	0.000	0.000	0.000
		23	-299.661	-32.047	-100.616	0.000	0.000	0.000
		24	-299.661	-32.047	-100.616	0.000	0.000	0.000
23	1	9	-145.311	-16.772	-76.366	0.000	0.000	0.000
		24	-145.311	-16.772	-76.366	0.000	0.000	0.000
		25	-145.311	-16.772	-76.366	0.000	0.000	0.000
24	1	10	25.288	-4.209	-58.569	0.000	0.000	0.000
		25	25.288	-4.209	-58.569	0.000	0.000	0.000
		26	25.288	-4.209	-58.569	0.000	0.000	0.000
25	1	11	210.948	3.785	-47.688	0.000	0.000	0.000
		26	210.948	3.785	-47.688	0.000	0.000	0.000
		27	210.948	3.785	-47.688	0.000	0.000	0.000

OUTPUT PAGE # 3

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
26	1	12	411.547	4.597	-43.757	0.000	0.000	0.000
		27	411.547	4.597	-43.757	0.000	0.000	0.000
		28	411.547	4.597	-43.757	0.000	0.000	0.000
27	1	13	628.950	-5.192	-45.521	0.000	0.000	0.000
		28	628.950	-5.192	-45.521	0.000	0.000	0.000
		29	628.950	-5.192	-45.521	0.000	0.000	0.000
28	1	14	869.582	-28.957	-47.775	0.000	0.000	0.000
		29	869.582	-28.957	-47.775	0.000	0.000	0.000
		30	869.582	-28.957	-47.775	0.000	0.000	0.000
29	1	15	1152.050	-65.031	-32.658	0.000	0.000	0.000
		30	1152.050	-65.031	-32.658	0.000	0.000	0.000
		31	1152.050	-65.031	-32.658	0.000	0.000	0.000
30	1	32	-822.135	-181.338	-388.963	0.000	0.000	0.000
		18	-822.135	-181.338	-388.963	0.000	0.000	0.000
		17	-822.135	-181.338	-388.963	0.000	0.000	0.000
31	1	33	-795.123	-143.179	-360.406	0.000	0.000	0.000
		19	-795.123	-143.179	-360.406	0.000	0.000	0.000
		18	-795.123	-143.179	-360.406	0.000	0.000	0.000
32	1	34	-727.648	-110.122	-333.962	0.000	0.000	0.000
		20	-727.648	-110.122	-333.962	0.000	0.000	0.000
		19	-727.648	-110.122	-333.962	0.000	0.000	0.000
33	1	35	-627.497	-79.839	-310.378	0.000	0.000	0.000
		21	-627.497	-79.839	-310.378	0.000	0.000	0.000
		20	-627.497	-79.839	-310.378	0.000	0.000	0.000
34	1	36	-499.910	-50.888	-289.869	0.000	0.000	0.000
		22	-499.910	-50.888	-289.869	0.000	0.000	0.000
		21	-499.910	-50.888	-289.869	0.000	0.000	0.000
35	1	37	-348.678	-22.645	-272.614	0.000	0.000	0.000
		23	-348.678	-22.645	-272.614	0.000	0.000	0.000
		22	-348.678	-22.645	-272.614	0.000	0.000	0.000
36	1	38	-176.657	4.853	-258.804	0.000	0.000	0.000
		24	-176.657	4.853	-258.804	0.000	0.000	0.000
		23	-176.657	4.853	-258.804	0.000	0.000	0.000
37	1	39	13.932	30.999	-248.553	0.000	0.000	0.000
		25	13.932	30.999	-248.553	0.000	0.000	0.000
		24	13.932	30.999	-248.553	0.000	0.000	0.000
38	1	40	221.279	54.585	-241.713	0.000	0.000	0.000
		26	221.279	54.585	-241.713	0.000	0.000	0.000
		25	221.279	54.585	-241.713	0.000	0.000	0.000

OUTPUT PAGE # 4

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
39	1	41	443.729	73.616	-237.553	0.000	0.000	0.000
		27	443.729	73.616	-237.553	0.000	0.000	0.000
		26	443.729	73.616	-237.553	0.000	0.000	0.000
40	1	42	679.217	84.894	-234.087	0.000	0.000	0.000
		28	679.217	84.894	-234.087	0.000	0.000	0.000
		27	679.217	84.894	-234.087	0.000	0.000	0.000
41	1	43	923.631	83.207	-226.606	0.000	0.000	0.000
		29	923.631	83.207	-226.606	0.000	0.000	0.000
		28	923.631	83.207	-226.606	0.000	0.000	0.000
42	1	44	1165.400	59.785	-204.092	0.000	0.000	0.000
		30	1165.400	59.785	-204.092	0.000	0.000	0.000
		29	1165.400	59.785	-204.092	0.000	0.000	0.000
43	1	45	1366.510	-0.697	-139.552	0.000	0.000	0.000
		31	1366.510	-0.697	-139.552	0.000	0.000	0.000
		30	1366.510	-0.697	-139.552	0.000	0.000	0.000
44	1	18	-819.092	-171.193	-344.428	0.000	0.000	0.000
		32	-819.092	-171.193	-344.428	0.000	0.000	0.000
		33	-819.092	-171.193	-344.428	0.000	0.000	0.000
45	1	19	-792.036	-132.886	-289.022	0.000	0.000	0.000
		33	-792.036	-132.886	-289.022	0.000	0.000	0.000
		34	-792.036	-132.886	-289.022	0.000	0.000	0.000
46	1	20	-725.640	-103.427	-241.451	0.000	0.000	0.000
		34	-725.640	-103.427	-241.451	0.000	0.000	0.000
		35	-725.640	-103.427	-241.451	0.000	0.000	0.000
47	1	21	-627.779	-80.781	-200.032	0.000	0.000	0.000
		35	-627.779	-80.781	-200.032	0.000	0.000	0.000
		36	-627.779	-80.781	-200.032	0.000	0.000	0.000
48	1	22	-503.799	-63.851	-163.821	0.000	0.000	0.000
		36	-503.799	-63.851	-163.821	0.000	0.000	0.000
		37	-503.799	-63.851	-163.821	0.000	0.000	0.000
49	1	23	-357.533	-52.163	-132.293	0.000	0.000	0.000
		37	-357.533	-52.163	-132.293	0.000	0.000	0.000
		38	-357.533	-52.163	-132.293	0.000	0.000	0.000
50	1	24	-191.811	-45.666	-105.102	0.000	0.000	0.000
		38	-191.811	-45.666	-105.102	0.000	0.000	0.000
		39	-191.811	-45.666	-105.102	0.000	0.000	0.000
51	1	25	-8.739	-44.575	-81.855	0.000	0.000	0.000
		39	-8.739	-44.575	-81.855	0.000	0.000	0.000
		40	-8.739	-44.575	-81.855	0.000	0.000	0.000

OUTPUT

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
52	1	26	190.146	-49.197	-61.837	0.000	0.000	0.000
		40	190.146	-49.197	-61.837	0.000	0.000	0.000
		41	190.146	-49.197	-61.837	0.000	0.000	0.000
53	1	27	403.751	-59.654	-43.635	0.000	0.000	0.000
		41	403.751	-59.654	-43.635	0.000	0.000	0.000
		42	403.751	-59.654	-43.635	0.000	0.000	0.000
54	1	28	631.156	-75.318	-24.590	0.000	0.000	0.000
		42	631.156	-75.318	-24.590	0.000	0.000	0.000
		43	631.156	-75.318	-24.590	0.000	0.000	0.000
55	1	29	870.549	-93.742	-0.188	0.000	0.000	0.000
		43	870.549	-93.742	-0.188	0.000	0.000	0.000
		44	870.549	-93.742	-0.188	0.000	0.000	0.000
56	1	30	1114.760	-109.042	35.419	0.000	0.000	0.000
		44	1114.760	-109.042	35.419	0.000	0.000	0.000
		45	1114.760	-109.042	35.419	0.000	0.000	0.000
57	1	46	-900.125	-195.502	-476.189	0.000	0.000	0.000
		33	-900.125	-195.502	-476.189	0.000	0.000	0.000
		32	-900.125	-195.502	-476.189	0.000	0.000	0.000
58	1	47	-812.808	-139.118	-423.911	0.000	0.000	0.000
		34	-812.808	-139.118	-423.911	0.000	0.000	0.000
		33	-812.808	-139.118	-423.911	0.000	0.000	0.000
59	1	48	-698.672	-95.338	-381.715	0.000	0.000	0.000
		35	-698.672	-95.338	-381.715	0.000	0.000	0.000
		34	-698.672	-95.338	-381.715	0.000	0.000	0.000
60	1	49	-560.745	-60.672	-346.576	0.000	0.000	0.000
		36	-560.745	-60.672	-346.576	0.000	0.000	0.000
		35	-560.745	-60.672	-346.576	0.000	0.000	0.000
61	1	50	-401.615	-33.197	-316.605	0.000	0.000	0.000
		37	-401.615	-33.197	-316.605	0.000	0.000	0.000
		36	-401.615	-33.197	-316.605	0.000	0.000	0.000
62	1	51	-223.632	-11.995	-290.526	0.000	0.000	0.000
		38	-223.632	-11.995	-290.526	0.000	0.000	0.000
		37	-223.632	-11.995	-290.526	0.000	0.000	0.000
63	1	52	-29.099	3.145	-267.323	0.000	0.000	0.000
		39	-29.099	3.145	-267.323	0.000	0.000	0.000
		38	-29.099	3.145	-267.323	0.000	0.000	0.000
64	1	53	179.491	11.891	-245.941	0.000	0.000	0.000
		40	179.491	11.891	-245.941	0.000	0.000	0.000
		39	179.491	11.891	-245.941	0.000	0.000	0.000

OUTPUT

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
65	1	54	399.104	13.487	-224.979	0.000	0.000	0.000
		41	399.104	13.487	-224.979	0.000	0.000	0.000
		40	399.104	13.487	-224.979	0.000	0.000	0.000
66	1	55	625.538	6.879	-202.350	0.000	0.000	0.000
		42	625.538	6.879	-202.350	0.000	0.000	0.000
		41	625.538	6.879	-202.350	0.000	0.000	0.000
67	1	56	852.315	-8.974	-174.911	0.000	0.000	0.000
		43	852.315	-8.974	-174.911	0.000	0.000	0.000
		42	852.315	-8.974	-174.911	0.000	0.000	0.000
68	1	57	1068.860	-34.250	-138.387	0.000	0.000	0.000
		44	1068.860	-34.250	-138.387	0.000	0.000	0.000
		43	1068.860	-34.250	-138.387	0.000	0.000	0.000
69	1	58	1259.070	-65.752	-89.142	0.000	0.000	0.000
		45	1259.070	-65.752	-89.142	0.000	0.000	0.000
		44	1259.070	-65.752	-89.142	0.000	0.000	0.000
70	1	33	-902.400	-203.085	-362.620	0.000	0.000	0.000
		46	-902.400	-203.085	-362.620	0.000	0.000	0.000
		47	-902.400	-203.085	-362.620	0.000	0.000	0.000
71	1	34	-820.013	-163.137	-297.982	0.000	0.000	0.000
		47	-820.013	-163.137	-297.982	0.000	0.000	0.000
		48	-820.013	-163.137	-297.982	0.000	0.000	0.000
72	1	35	-709.719	-132.162	-243.321	0.000	0.000	0.000
		48	-709.719	-132.162	-243.321	0.000	0.000	0.000
		49	-709.719	-132.162	-243.321	0.000	0.000	0.000
73	1	36	-575.329	-109.288	-195.923	0.000	0.000	0.000
		49	-575.329	-109.288	-195.923	0.000	0.000	0.000
		50	-575.329	-109.288	-195.923	0.000	0.000	0.000
74	1	37	-419.810	-93.851	-154.081	0.000	0.000	0.000
		50	-419.810	-93.851	-154.081	0.000	0.000	0.000
		51	-419.810	-93.851	-154.081	0.000	0.000	0.000
75	1	38	-245.623	-85.302	-116.655	0.000	0.000	0.000
		51	-245.623	-85.302	-116.655	0.000	0.000	0.000
		52	-245.623	-85.302	-116.655	0.000	0.000	0.000
76	1	39	-54.967	-83.087	-82.762	0.000	0.000	0.000
		52	-54.967	-83.087	-82.762	0.000	0.000	0.000
		53	-54.967	-83.087	-82.762	0.000	0.000	0.000
77	1	40	149.975	-86.501	-51.555	0.000	0.000	0.000
		53	149.975	-86.501	-51.555	0.000	0.000	0.000
		54	149.975	-86.501	-51.555	0.000	0.000	0.000

OUTPUT

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
78	1	41	366.715	-94.485	-22.080	0.000	0.000	0.000
		54	366.715	-94.485	-22.080	0.000	0.000	0.000
		55	366.715	-94.485	-22.080	0.000	0.000	0.000
79	1	42	591.866	-105.370	6.707	0.000	0.000	0.000
		55	591.866	-105.370	6.707	0.000	0.000	0.000
		56	591.866	-105.370	6.707	0.000	0.000	0.000
80	1	43	820.013	-116.655	35.518	0.000	0.000	0.000
		56	820.013	-116.655	35.518	0.000	0.000	0.000
		57	820.013	-116.655	35.518	0.000	0.000	0.000
81	1	44	1041.590	-125.148	63.319	0.000	0.000	0.000
		57	1041.590	-125.148	63.319	0.000	0.000	0.000
		58	1041.590	-125.148	63.319	0.000	0.000	0.000
82	1	59	-946.515	-216.319	-538.646	0.000	0.000	0.000
		47	-946.515	-216.319	-538.646	0.000	0.000	0.000
		46	-946.515	-216.319	-538.646	0.000	0.000	0.000
83	1	60	-810.529	-160.292	-471.622	0.000	0.000	0.000
		48	-810.529	-160.292	-471.622	0.000	0.000	0.000
		47	-810.529	-160.292	-471.622	0.000	0.000	0.000
84	1	61	-657.225	-116.415	-415.595	0.000	0.000	0.000
		49	-657.225	-116.415	-415.595	0.000	0.000	0.000
		48	-657.225	-116.415	-415.595	0.000	0.000	0.000
85	1	62	-487.034	-82.801	-367.290	0.000	0.000	0.000
		50	-487.034	-82.801	-367.290	0.000	0.000	0.000
		49	-487.034	-82.801	-367.290	0.000	0.000	0.000
86	1	63	-301.035	-58.221	-324.514	0.000	0.000	0.000
		51	-301.035	-58.221	-324.514	0.000	0.000	0.000
		50	-301.035	-58.221	-324.514	0.000	0.000	0.000
87	1	64	-100.863	-41.877	-285.714	0.000	0.000	0.000
		52	-100.863	-41.877	-285.714	0.000	0.000	0.000
		51	-100.863	-41.877	-285.714	0.000	0.000	0.000
88	1	65	111.271	-33.219	-249.678	0.000	0.000	0.000
		53	111.271	-33.219	-249.678	0.000	0.000	0.000
		52	111.271	-33.219	-249.678	0.000	0.000	0.000
89	1	66	332.468	-31.756	-215.344	0.000	0.000	0.000
		54	332.468	-31.756	-215.344	0.000	0.000	0.000
		53	332.468	-31.756	-215.344	0.000	0.000	0.000
90	1	67	558.949	-36.818	-181.730	0.000	0.000	0.000
		55	558.949	-36.818	-181.730	0.000	0.000	0.000
		54	558.949	-36.818	-181.730	0.000	0.000	0.000

OUTPUT

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
91	1	68	785.871	-47.172	-148.088	0.000	0.000	0.000
		56	785.871	-47.172	-148.088	0.000	0.000	0.000
		55	785.871	-47.172	-148.088	0.000	0.000	0.000
92	1	69	1007.470	-60.419	-114.527	0.000	0.000	0.000
		57	1007.470	-60.419	-114.527	0.000	0.000	0.000
		56	1007.470	-60.419	-114.527	0.000	0.000	0.000
93	1	70	1218.480	-72.085	-83.610	0.000	0.000	0.000
		58	1218.480	-72.085	-83.610	0.000	0.000	0.000
		57	1218.480	-72.085	-83.610	0.000	0.000	0.000
94	1	47	-949.631	-226.704	-375.196	0.000	0.000	0.000
		59	-949.631	-226.704	-375.196	0.000	0.000	0.000
		60	-949.631	-226.704	-375.196	0.000	0.000	0.000
95	1	48	-819.235	-189.313	-303.120	0.000	0.000	0.000
		60	-819.235	-189.313	-303.120	0.000	0.000	0.000
		61	-819.235	-189.313	-303.120	0.000	0.000	0.000
96	1	49	-670.254	-159.846	-239.881	0.000	0.000	0.000
		61	-670.254	-159.846	-239.881	0.000	0.000	0.000
		62	-670.254	-159.846	-239.881	0.000	0.000	0.000
97	1	50	-503.627	-138.115	-183.430	0.000	0.000	0.000
		62	-503.627	-138.115	-183.430	0.000	0.000	0.000
		63	-503.627	-138.115	-183.430	0.000	0.000	0.000
98	1	51	-320.671	-123.680	-132.453	0.000	0.000	0.000
		63	-320.671	-123.680	-132.453	0.000	0.000	0.000
		64	-320.671	-123.680	-132.453	0.000	0.000	0.000
99	1	52	-123.059	-115.866	-86.117	0.000	0.000	0.000
		64	-123.059	-115.866	-86.117	0.000	0.000	0.000
		65	-123.059	-115.866	-86.117	0.000	0.000	0.000
100	1	53	87.115	-113.742	-43.914	0.000	0.000	0.000
		65	87.115	-113.742	-43.914	0.000	0.000	0.000
		66	87.115	-113.742	-43.914	0.000	0.000	0.000
101	1	54	307.174	-116.076	-5.626	0.000	0.000	0.000
		66	307.174	-116.076	-5.626	0.000	0.000	0.000
		67	307.174	-116.076	-5.626	0.000	0.000	0.000
102	1	55	533.598	-121.325	28.566	0.000	0.000	0.000
		67	533.598	-121.325	28.566	0.000	0.000	0.000
		68	533.598	-121.325	28.566	0.000	0.000	0.000
103	1	56	761.712	-127.707	57.762	0.000	0.000	0.000
		68	761.712	-127.707	57.762	0.000	0.000	0.000
		69	761.712	-127.707	57.762	0.000	0.000	0.000

OUTPUT

PAGE # 9

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
104	1	57	985.551	-133.513	79.776	0.000	0.000	0.000
		69	985.551	-133.513	79.776	0.000	0.000	0.000
		70	985.551	-133.513	79.776	0.000	0.000	0.000
105	1	71	-961.341	-230.217	-572.881	0.000	0.000	0.000
		60	-961.341	-230.217	-572.881	0.000	0.000	0.000
		59	-961.341	-230.217	-572.881	0.000	0.000	0.000
106	1	72	-790.210	-180.606	-497.218	0.000	0.000	0.000
		61	-790.210	-180.606	-497.218	0.000	0.000	0.000
		60	-790.210	-180.606	-497.218	0.000	0.000	0.000
107	1	73	-606.323	-140.668	-430.475	0.000	0.000	0.000
		62	-606.323	-140.668	-430.475	0.000	0.000	0.000
		61	-606.323	-140.668	-430.475	0.000	0.000	0.000
108	1	74	-409.352	-109.834	-370.584	0.000	0.000	0.000
		63	-409.352	-109.834	-370.584	0.000	0.000	0.000
		62	-409.352	-109.834	-370.584	0.000	0.000	0.000
109	1	75	-199.935	-87.461	-316.180	0.000	0.000	0.000
		64	-199.935	-87.461	-316.180	0.000	0.000	0.000
		63	-199.935	-87.461	-316.180	0.000	0.000	0.000
110	1	76	20.507	-72.799	-266.398	0.000	0.000	0.000
		65	20.507	-72.799	-266.398	0.000	0.000	0.000
		64	20.507	-72.799	-266.398	0.000	0.000	0.000
111	1	77	249.868	-64.919	-220.771	0.000	0.000	0.000
		66	249.868	-64.919	-220.771	0.000	0.000	0.000
		65	249.868	-64.919	-220.771	0.000	0.000	0.000
112	1	78	485.460	-62.594	-179.239	0.000	0.000	0.000
		67	485.460	-62.594	-179.239	0.000	0.000	0.000
		66	485.460	-62.594	-179.239	0.000	0.000	0.000
113	1	79	724.200	-64.148	-142.297	0.000	0.000	0.000
		68	724.200	-64.148	-142.297	0.000	0.000	0.000
		67	724.200	-64.148	-142.297	0.000	0.000	0.000
114	1	80	963.041	-67.312	-111.335	0.000	0.000	0.000
		69	963.041	-67.312	-111.335	0.000	0.000	0.000
		68	963.041	-67.312	-111.335	0.000	0.000	0.000
115	1	81	1199.830	-69.231	-89.102	0.000	0.000	0.000
		70	1199.830	-69.231	-89.102	0.000	0.000	0.000
		69	1199.830	-69.231	-89.102	0.000	0.000	0.000
116	1	60	-963.900	-238.747	-375.864	0.000	0.000	0.000
		71	-963.900	-238.747	-375.864	0.000	0.000	0.000
		72	-963.900	-238.747	-375.864	0.000	0.000	0.000

OUTPUT

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
117	1	61	-797.232	-204.013	-297.068	0.000	0.000	0.000
		72	-797.232	-204.013	-297.068	0.000	0.000	0.000
		73	-797.232	-204.013	-297.068	0.000	0.000	0.000
118	1	62	-617.020	-176.328	-225.374	0.000	0.000	0.000
		73	-617.020	-176.328	-225.374	0.000	0.000	0.000
		74	-617.020	-176.328	-225.374	0.000	0.000	0.000
119	1	63	-423.114	-155.708	-160.000	0.000	0.000	0.000
		74	-423.114	-155.708	-160.000	0.000	0.000	0.000
		75	-423.114	-155.708	-160.000	0.000	0.000	0.000
120	1	64	-216.224	-141.760	-100.602	0.000	0.000	0.000
		75	-216.224	-141.760	-100.602	0.000	0.000	0.000
		76	-216.224	-141.760	-100.602	0.000	0.000	0.000
121	1	65	2.220	-133.757	-47.203	0.000	0.000	0.000
		76	2.220	-133.757	-47.203	0.000	0.000	0.000
		77	2.220	-133.757	-47.203	0.000	0.000	0.000
122	1	66	230.134	-130.700	-0.179	0.000	0.000	0.000
		77	230.134	-130.700	-0.179	0.000	0.000	0.000
		78	230.134	-130.700	-0.179	0.000	0.000	0.000
123	1	67	464.820	-131.396	39.679	0.000	0.000	0.000
		78	464.820	-131.396	39.679	0.000	0.000	0.000
		79	464.820	-131.396	39.679	0.000	0.000	0.000
124	1	68	703.069	-134.587	71.062	0.000	0.000	0.000
		79	703.069	-134.587	71.062	0.000	0.000	0.000
		80	703.069	-134.587	71.062	0.000	0.000	0.000
125	1	69	941.491	-139.150	92.038	0.000	0.000	0.000
		80	941.491	-139.150	92.038	0.000	0.000	0.000
		81	941.491	-139.150	92.038	0.000	0.000	0.000
126	1	82	-953.492	-235.625	-586.761	0.000	0.000	0.000
		72	-953.492	-235.625	-586.761	0.000	0.000	0.000
		71	-953.492	-235.625	-586.761	0.000	0.000	0.000
127	1	83	-755.939	-191.626	-504.900	0.000	0.000	0.000
		73	-755.939	-191.626	-504.900	0.000	0.000	0.000
		72	-755.939	-191.626	-504.900	0.000	0.000	0.000
128	1	84	-546.411	-155.146	-429.852	0.000	0.000	0.000
		74	-546.411	-155.146	-429.852	0.000	0.000	0.000
		73	-546.411	-155.146	-429.852	0.000	0.000	0.000
129	1	85	-324.769	-126.206	-361.080	0.000	0.000	0.000
		75	-324.769	-126.206	-361.080	0.000	0.000	0.000
		74	-324.769	-126.206	-361.080	0.000	0.000	0.000

OUTPUT

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
130	1	86	-91.720	-104.411	-298.430	0.000	0.000	0.000
		76	-91.720	-104.411	-298.430	0.000	0.000	0.000
		75	-91.720	-104.411	-298.430	0.000	0.000	0.000
131	1	87	151.379	-89.012	-242.108	0.000	0.000	0.000
		77	151.379	-89.012	-242.108	0.000	0.000	0.000
		76	151.379	-89.012	-242.108	0.000	0.000	0.000
132	1	88	402.712	-78.930	-192.692	0.000	0.000	0.000
		78	402.712	-78.930	-192.692	0.000	0.000	0.000
		77	402.712	-78.930	-192.692	0.000	0.000	0.000
133	1	89	660.239	-72.774	-151.202	0.000	0.000	0.000
		79	660.239	-72.774	-151.202	0.000	0.000	0.000
		78	660.239	-72.774	-151.202	0.000	0.000	0.000
134	1	90	922.006	-68.911	-119.175	0.000	0.000	0.000
		80	922.006	-68.911	-119.175	0.000	0.000	0.000
		79	922.006	-68.911	-119.175	0.000	0.000	0.000
135	1	91	1186.520	-65.644	-98.692	0.000	0.000	0.000
		81	1186.520	-65.644	-98.692	0.000	0.000	0.000
		80	1186.520	-65.644	-98.692	0.000	0.000	0.000
136	1	72	-955.262	-241.523	-364.990	0.000	0.000	0.000
		82	-955.262	-241.523	-364.990	0.000	0.000	0.000
		83	-955.262	-241.523	-364.990	0.000	0.000	0.000
137	1	73	-760.887	-208.119	-279.277	0.000	0.000	0.000
		83	-760.887	-208.119	-279.277	0.000	0.000	0.000
		84	-760.887	-208.119	-279.277	0.000	0.000	0.000
138	1	74	-554.347	-181.600	-199.852	0.000	0.000	0.000
		84	-554.347	-181.600	-199.852	0.000	0.000	0.000
		85	-554.347	-181.600	-199.852	0.000	0.000	0.000
139	1	75	-335.483	-161.924	-127.190	0.000	0.000	0.000
		85	-335.483	-161.924	-127.190	0.000	0.000	0.000
		86	-335.483	-161.924	-127.190	0.000	0.000	0.000
140	1	76	-104.996	-148.669	-61.976	0.000	0.000	0.000
		86	-104.996	-148.669	-61.976	0.000	0.000	0.000
		87	-104.996	-148.669	-61.976	0.000	0.000	0.000
141	1	77	135.745	-141.127	-5.122	0.000	0.000	0.000
		87	135.745	-141.127	-5.122	0.000	0.000	0.000
		88	135.745	-141.127	-5.122	0.000	0.000	0.000
142	1	78	384.870	-138.407	42.215	0.000	0.000	0.000
		88	384.870	-138.407	42.215	0.000	0.000	0.000
		89	384.870	-138.407	42.215	0.000	0.000	0.000

OUTPUT PAGE # 12

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
143	1	79	640.212	-139.534	78.621	0.000	0.000	0.000
		89	640.212	-139.534	78.621	0.000	0.000	0.000
		90	640.212	-139.534	78.621	0.000	0.000	0.000
144	1	80	899.610	-143.566	102.469	0.000	0.000	0.000
		90	899.610	-143.566	102.469	0.000	0.000	0.000
		91	899.610	-143.566	102.469	0.000	0.000	0.000
145	1	92	-931.357	-234.352	-589.391	0.000	0.000	0.000
		83	-931.357	-234.352	-589.391	0.000	0.000	0.000
		82	-931.357	-234.352	-589.391	0.000	0.000	0.000
146	1	93	-709.778	-192.787	-501.528	0.000	0.000	0.000
		84	-709.778	-192.787	-501.528	0.000	0.000	0.000
		83	-709.778	-192.787	-501.528	0.000	0.000	0.000
147	1	94	-474.562	-157.666	-419.670	0.000	0.000	0.000
		85	-474.562	-157.666	-419.670	0.000	0.000	0.000
		84	-474.562	-157.666	-419.670	0.000	0.000	0.000
148	1	95	-226.100	-129.111	-344.601	0.000	0.000	0.000
		86	-226.100	-129.111	-344.601	0.000	0.000	0.000
		85	-226.100	-129.111	-344.601	0.000	0.000	0.000
149	1	96	34.633	-106.782	-277.258	0.000	0.000	0.000
		87	34.633	-106.782	-277.258	0.000	0.000	0.000
		86	34.633	-106.782	-277.258	0.000	0.000	0.000
150	1	97	306.248	-89.980	-218.767	0.000	0.000	0.000
		88	306.248	-89.980	-218.767	0.000	0.000	0.000
		87	306.248	-89.980	-218.767	0.000	0.000	0.000
151	1	98	587.120	-77.736	-170.466	0.000	0.000	0.000
		89	587.120	-77.736	-170.466	0.000	0.000	0.000
		88	587.120	-77.736	-170.466	0.000	0.000	0.000
152	1	99	875.567	-68.932	-133.895	0.000	0.000	0.000
		90	875.567	-68.932	-133.895	0.000	0.000	0.000
		89	875.567	-68.932	-133.895	0.000	0.000	0.000
153	1	100	1170.010	-62.449	-110.724	0.000	0.000	0.000
		91	1170.010	-62.449	-110.724	0.000	0.000	0.000
		90	1170.010	-62.449	-110.724	0.000	0.000	0.000
154	1	83	-932.620	-238.561	-344.724	0.000	0.000	0.000
		92	-932.620	-238.561	-344.724	0.000	0.000	0.000
		93	-932.620	-238.561	-344.724	0.000	0.000	0.000
155	1	84	-713.544	-205.340	-251.455	0.000	0.000	0.000
		93	-713.544	-205.340	-251.455	0.000	0.000	0.000
		94	-713.544	-205.340	-251.455	0.000	0.000	0.000

OUTPUT

PAGE # 13

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
156	1	85	-481.151	-179.630	-165.061	0.000	0.000	0.000
		94	-481.151	-179.630	-165.061	0.000	0.000	0.000
		95	-481.151	-179.630	-165.061	0.000	0.000	0.000
157	1	86	-235.727	-161.203	-86.974	0.000	0.000	0.000
		95	-235.727	-161.203	-86.974	0.000	0.000	0.000
		96	-235.727	-161.203	-86.974	0.000	0.000	0.000
158	1	87	21.804	-149.547	-18.660	0.000	0.000	0.000
		96	21.804	-149.547	-18.660	0.000	0.000	0.000
		97	21.804	-149.547	-18.660	0.000	0.000	0.000
159	1	88	290.059	-143.945	38.363	0.000	0.000	0.000
		97	290.059	-143.945	38.363	0.000	0.000	0.000
		98	290.059	-143.945	38.363	0.000	0.000	0.000
160	1	89	567.375	-143.555	82.531	0.000	0.000	0.000
		98	567.375	-143.555	82.531	0.000	0.000	0.000
		99	567.375	-143.555	82.531	0.000	0.000	0.000
161	1	90	852.010	-147.459	112.287	0.000	0.000	0.000
		99	852.010	-147.459	112.287	0.000	0.000	0.000
		100	852.010	-147.459	112.287	0.000	0.000	0.000
162	1	101	-899.063	-228.495	-587.269	0.000	0.000	0.000
		93	-899.063	-228.495	-587.269	0.000	0.000	0.000
		92	-899.063	-228.495	-587.269	0.000	0.000	0.000
163	1	102	-650.296	-186.367	-492.520	0.000	0.000	0.000
		94	-650.296	-186.367	-492.520	0.000	0.000	0.000
		93	-650.296	-186.367	-492.520	0.000	0.000	0.000
164	1	103	-384.936	-150.767	-404.539	0.000	0.000	0.000
		95	-384.936	-150.767	-404.539	0.000	0.000	0.000
		94	-384.936	-150.767	-404.539	0.000	0.000	0.000
165	1	104	-103.997	-121.687	-325.018	0.000	0.000	0.000
		96	-103.997	-121.687	-325.018	0.000	0.000	0.000
		95	-103.997	-121.687	-325.018	0.000	0.000	0.000
166	1	105	191.145	-98.748	-255.626	0.000	0.000	0.000
		97	191.145	-98.748	-255.626	0.000	0.000	0.000
		96	191.145	-98.748	-255.626	0.000	0.000	0.000
167	1	106	498.870	-81.306	-198.033	0.000	0.000	0.000
		98	498.870	-81.306	-198.033	0.000	0.000	0.000
		97	498.870	-81.306	-198.033	0.000	0.000	0.000
168	1	107	817.396	-68.553	-153.911	0.000	0.000	0.000
		99	817.396	-68.553	-153.911	0.000	0.000	0.000
		98	817.396	-68.553	-153.911	0.000	0.000	0.000

OUTPUT

PAGE # 14

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
169	1	108	1144.840	-59.616	-124.877	0.000	0.000	0.000
		100	1144.840	-59.616	-124.877	0.000	0.000	0.000
		99	1144.840	-59.616	-124.877	0.000	0.000	0.000
170	1	93	-900.292	-232.593	-316.411	0.000	0.000	0.000
		101	-900.292	-232.593	-316.411	0.000	0.000	0.000
		102	-900.292	-232.593	-316.411	0.000	0.000	0.000
171	1	94	-654.165	-199.265	-214.833	0.000	0.000	0.000
		102	-654.165	-199.265	-214.833	0.000	0.000	0.000
		103	-654.165	-199.265	-214.833	0.000	0.000	0.000
172	1	95	-392.105	-174.665	-122.050	0.000	0.000	0.000
		103	-392.105	-174.665	-122.050	0.000	0.000	0.000
		104	-392.105	-174.665	-122.050	0.000	0.000	0.000
173	1	96	-114.977	-158.288	-40.092	0.000	0.000	0.000
		104	-114.977	-158.288	-40.092	0.000	0.000	0.000
		105	-114.977	-158.288	-40.092	0.000	0.000	0.000
174	1	97	175.933	-149.458	29.133	0.000	0.000	0.000
		105	175.933	-149.458	29.133	0.000	0.000	0.000
		106	175.933	-149.458	29.133	0.000	0.000	0.000
175	1	98	479.045	-147.390	83.812	0.000	0.000	0.000
		106	479.045	-147.390	83.812	0.000	0.000	0.000
		107	479.045	-147.390	83.812	0.000	0.000	0.000
176	1	99	792.601	-151.206	122.238	0.000	0.000	0.000
		107	792.601	-151.206	122.238	0.000	0.000	0.000
		108	792.601	-151.206	122.238	0.000	0.000	0.000
177	1	109	-855.799	-219.246	-583.270	0.000	0.000	0.000
		102	-855.799	-219.246	-583.270	0.000	0.000	0.000
		101	-855.799	-219.246	-583.270	0.000	0.000	0.000
178	1	110	-572.605	-174.798	-480.427	0.000	0.000	0.000
		103	-572.605	-174.798	-480.427	0.000	0.000	0.000
		102	-572.605	-174.798	-480.427	0.000	0.000	0.000
179	1	111	-269.486	-137.881	-386.511	0.000	0.000	0.000
		104	-269.486	-137.881	-386.511	0.000	0.000	0.000
		103	-269.486	-137.881	-386.511	0.000	0.000	0.000
180	1	112	51.856	-108.241	-303.706	0.000	0.000	0.000
		105	51.856	-108.241	-303.706	0.000	0.000	0.000
		104	51.856	-108.241	-303.706	0.000	0.000	0.000
181	1	113	389.566	-85.372	-234.028	0.000	0.000	0.000
		106	389.566	-85.372	-234.028	0.000	0.000	0.000
		105	389.566	-85.372	-234.028	0.000	0.000	0.000

OUTPUT PAGE # 15

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
182	1	114	741.694	-68.600	-179.378	0.000	0.000	0.000
		107	741.694	-68.600	-179.378	0.000	0.000	0.000
		106	741.694	-68.600	-179.378	0.000	0.000	0.000
183	1	115	1106.170	-57.140	-141.571	0.000	0.000	0.000
		108	1106.170	-57.140	-141.571	0.000	0.000	0.000
		107	1106.170	-57.140	-141.571	0.000	0.000	0.000
184	1	102	-857.502	-224.923	-279.635	0.000	0.000	0.000
		109	-857.502	-224.923	-279.635	0.000	0.000	0.000
		110	-857.502	-224.923	-279.635	0.000	0.000	0.000
185	1	103	-577.831	-192.217	-169.196	0.000	0.000	0.000
		110	-577.831	-192.217	-169.196	0.000	0.000	0.000
		111	-577.831	-192.217	-169.196	0.000	0.000	0.000
186	1	104	-279.016	-169.648	-70.634	0.000	0.000	0.000
		111	-279.016	-169.648	-70.634	0.000	0.000	0.000
		112	-279.016	-169.648	-70.634	0.000	0.000	0.000
187	1	105	37.419	-156.366	13.814	0.000	0.000	0.000
		112	37.419	-156.366	13.814	0.000	0.000	0.000
		113	37.419	-156.366	13.814	0.000	0.000	0.000
188	1	106	369.692	-151.622	82.129	0.000	0.000	0.000
		113	369.692	-151.622	82.129	0.000	0.000	0.000
		114	369.692	-151.622	82.129	0.000	0.000	0.000
189	1	107	715.839	-154.789	132.418	0.000	0.000	0.000
		114	715.839	-154.789	132.418	0.000	0.000	0.000
		115	715.839	-154.789	132.418	0.000	0.000	0.000
190	1	116	-796.183	-206.528	-577.020	0.000	0.000	0.000
		110	-796.183	-206.528	-577.020	0.000	0.000	0.000
		109	-796.183	-206.528	-577.020	0.000	0.000	0.000
191	1	117	-468.539	-159.432	-465.127	0.000	0.000	0.000
		111	-468.539	-159.432	-465.127	0.000	0.000	0.000
		110	-468.539	-159.432	-465.127	0.000	0.000	0.000
192	1	118	-118.222	-121.412	-365.526	0.000	0.000	0.000
		112	-118.222	-121.412	-365.526	0.000	0.000	0.000
		111	-118.222	-121.412	-365.526	0.000	0.000	0.000
193	1	119	252.453	-91.860	-280.441	0.000	0.000	0.000
		113	252.453	-91.860	-280.441	0.000	0.000	0.000
		112	252.453	-91.860	-280.441	0.000	0.000	0.000
194	1	120	641.533	-70.074	-211.865	0.000	0.000	0.000
		114	641.533	-70.074	-211.865	0.000	0.000	0.000
		113	641.533	-70.074	-211.865	0.000	0.000	0.000

OUTPUT PAGE # 16

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
195	1	121	1047.400	-55.325	-161.801	0.000	0.000	0.000
		115	1047.400	-55.325	-161.801	0.000	0.000	0.000
		114	1047.400	-55.325	-161.801	0.000	0.000	0.000
196	1	110	-798.914	-215.633	-232.207	0.000	0.000	0.000
		116	-798.914	-215.633	-232.207	0.000	0.000	0.000
		117	-798.914	-215.633	-232.207	0.000	0.000	0.000
197	1	111	-476.289	-185.268	-113.196	0.000	0.000	0.000
		117	-476.289	-185.268	-113.196	0.000	0.000	0.000
		118	-476.289	-185.268	-113.196	0.000	0.000	0.000
198	1	112	-131.565	-165.893	-10.037	0.000	0.000	0.000
		118	-131.565	-165.893	-10.037	0.000	0.000	0.000
		119	-131.565	-165.893	-10.037	0.000	0.000	0.000
199	1	113	233.025	-156.623	75.483	0.000	0.000	0.000
		119	233.025	-156.623	75.483	0.000	0.000	0.000
		120	233.025	-156.623	75.483	0.000	0.000	0.000
200	1	114	615.293	-157.545	141.740	0.000	0.000	0.000
		120	615.293	-157.545	141.740	0.000	0.000	0.000
		121	615.293	-157.545	141.740	0.000	0.000	0.000
201	1	122	-710.068	-188.980	-565.345	0.000	0.000	0.000
		117	-710.068	-188.980	-565.345	0.000	0.000	0.000
		116	-710.068	-188.980	-565.345	0.000	0.000	0.000
202	1	123	-326.690	-140.391	-444.445	0.000	0.000	0.000
		118	-326.690	-140.391	-444.445	0.000	0.000	0.000
		117	-326.690	-140.391	-444.445	0.000	0.000	0.000
203	1	124	79.834	-102.477	-340.127	0.000	0.000	0.000
		119	79.834	-102.477	-340.127	0.000	0.000	0.000
		118	79.834	-102.477	-340.127	0.000	0.000	0.000
204	1	125	507.727	-74.218	-253.757	0.000	0.000	0.000
		120	507.727	-74.218	-253.757	0.000	0.000	0.000
		119	507.727	-74.218	-253.757	0.000	0.000	0.000
205	1	126	957.281	-54.955	-186.803	0.000	0.000	0.000
		121	957.281	-54.955	-186.803	0.000	0.000	0.000
		120	957.281	-54.955	-186.803	0.000	0.000	0.000
206	1	117	-714.581	-204.026	-170.885	0.000	0.000	0.000
		122	-714.581	-204.026	-170.885	0.000	0.000	0.000
		123	-714.581	-204.026	-170.885	0.000	0.000	0.000
207	1	118	-338.048	-178.254	-45.695	0.000	0.000	0.000
		123	-338.048	-178.254	-45.695	0.000	0.000	0.000
		124	-338.048	-178.254	-45.695	0.000	0.000	0.000

OUTPUT PAGE # 17

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
208	1	119	61.865	-162.379	60.110	0.000	0.000	0.000
		124	61.865	-162.379	60.110	0.000	0.000	0.000
		125	61.865	-162.379	60.110	0.000	0.000	0.000
209	1	120	482.679	-157.716	146.950	0.000	0.000	0.000
		125	482.679	-157.716	146.950	0.000	0.000	0.000
		126	482.679	-157.716	146.950	0.000	0.000	0.000
210	1	127	-581.446	-164.088	-541.442	0.000	0.000	0.000
		123	-581.446	-164.088	-541.442	0.000	0.000	0.000
		122	-581.446	-164.088	-541.442	0.000	0.000	0.000
211	1	128	-134.985	-117.339	-413.895	0.000	0.000	0.000
		124	-134.985	-117.339	-413.895	0.000	0.000	0.000
		123	-134.985	-117.339	-413.895	0.000	0.000	0.000
212	1	129	329.568	-82.073	-306.361	0.000	0.000	0.000
		125	329.568	-82.073	-306.361	0.000	0.000	0.000
		124	329.568	-82.073	-306.361	0.000	0.000	0.000
213	1	130	816.966	-57.436	-217.108	0.000	0.000	0.000
		126	816.966	-57.436	-217.108	0.000	0.000	0.000
		125	816.966	-57.436	-217.108	0.000	0.000	0.000
214	1	123	-588.766	-188.488	-93.740	0.000	0.000	0.000
		127	-588.766	-188.488	-93.740	0.000	0.000	0.000
		128	-588.766	-188.488	-93.740	0.000	0.000	0.000
215	1	124	-149.990	-167.358	31.592	0.000	0.000	0.000
		128	-149.990	-167.358	31.592	0.000	0.000	0.000
		129	-149.990	-167.358	31.592	0.000	0.000	0.000
216	1	125	308.653	-151.793	140.956	0.000	0.000	0.000
		129	308.653	-151.793	140.956	0.000	0.000	0.000
		130	308.653	-151.793	140.956	0.000	0.000	0.000
217	1	131	-390.800	-129.102	-491.369	0.000	0.000	0.000
		128	-390.800	-129.102	-491.369	0.000	0.000	0.000
		127	-390.800	-129.102	-491.369	0.000	0.000	0.000
218	1	132	102.151	-91.720	-363.262	0.000	0.000	0.000
		129	102.151	-91.720	-363.262	0.000	0.000	0.000
		128	102.151	-91.720	-363.262	0.000	0.000	0.000
219	1	133	600.441	-64.262	-249.219	0.000	0.000	0.000
		130	600.441	-64.262	-249.219	0.000	0.000	0.000
		129	600.441	-64.262	-249.219	0.000	0.000	0.000
220	1	128	-401.049	-163.268	-7.958	0.000	0.000	0.000
		131	-401.049	-163.268	-7.958	0.000	0.000	0.000
		132	-401.049	-163.268	-7.958	0.000	0.000	0.000

OUTPUT PAGE # 18

EXAMPLE PROBLEM # 3
TRIANGULAR PLATE...PLANE STRESS EXAMPLE

ELEMENT NODE STRESSES, UNITS= INCHES POUNDS

ELEM#	LC#	JNT	NX	NY	NXY	MX	MY	MXY
221	1	129	89.257	-134.702	111.808	0.000	0.000	0.000
		132	89.257	-134.702	111.808	0.000	0.000	0.000
		133	89.257	-134.702	111.808	0.000	0.000	0.000
222	1	134	-144.790	-86.395	-387.969	0.000	0.000	0.000
		132	-144.790	-86.395	-387.969	0.000	0.000	0.000
		131	-144.790	-86.395	-387.969	0.000	0.000	0.000
223	1	135	295.633	-72.793	-264.212	0.000	0.000	0.000
		133	295.633	-72.793	-264.212	0.000	0.000	0.000
		132	295.633	-72.793	-264.212	0.000	0.000	0.000
224	1	132	-150.843	-106.571	52.182	0.000	0.000	0.000
		134	-150.843	-106.571	52.182	0.000	0.000	0.000
		135	-150.843	-106.571	52.182	0.000	0.000	0.000
225	1	136	-0.000	-61.321	-199.999	0.000	0.000	0.000
		135	-0.000	-61.321	-199.999	0.000	0.000	0.000
		134	-0.000	-61.321	-199.999	0.000	0.000	0.000

CONSISTANT STRESS RESULTANTS AT JOINTS ... UNITS.. IN & LBS

JNT	LC#	NX	NY	NXY	MX	MY	MXY
1	1	-739.614	-250.502	-307.218	0.000	0.000	0.000
2	1	-725.127	-213.322	-317.211	0.000	0.000	0.000
3	1	-745.965	-222.110	-289.826	0.000	0.000	0.000
4	1	-707.614	-212.115	-266.709	0.000	0.000	0.000
5	1	-636.755	-190.366	-240.473	0.000	0.000	0.000
6	1	-536.393	-160.560	-215.574	0.000	0.000	0.000
7	1	-410.999	-122.937	-193.590	0.000	0.000	0.000
8	1	-264.131	-78.885	-175.935	0.000	0.000	0.000
9	1	-98.001	-29.000	-164.083	0.000	0.000	0.000
10	1	86.022	26.313	-159.609	0.000	0.000	0.000
11	1	287.840	87.006	-164.110	0.000	0.000	0.000
12	1	509.719	154.267	-181.397	0.000	0.000	0.000
13	1	755.780	225.363	-208.546	0.000	0.000	0.000
14	1	1052.390	334.849	-281.689	0.000	0.000	0.000
15	1	1408.946	349.568	-288.456	0.000	0.000	0.000
16	1	2005.799	818.278	-594.168	0.000	0.000	0.000
17	1	-752.713	-172.741	-361.058	0.000	0.000	0.000
18	1	-768.447	-152.131	-335.471	0.000	0.000	0.000
19	1	-744.082	-118.096	-297.755	0.000	0.000	0.000
20	1	-683.830	-95.564	-262.476	0.000	0.000	0.000
21	1	-590.573	-72.137	-230.660	0.000	0.000	0.000
22	1	-471.626	-49.898	-202.028	0.000	0.000	0.000
23	1	-329.840	-28.041	-177.695	0.000	0.000	0.000
24	1	-168.353	-7.143	-157.940	0.000	0.000	0.000
25	1	10.836	11.906	-143.250	0.000	0.000	0.000
26	1	206.227	27.568	-133.667	0.000	0.000	0.000
27	1	416.857	37.446	-128.999	0.000	0.000	0.000
28	1	642.442	38.876	-126.720	0.000	0.000	0.000
29	1	883.017	24.821	-126.144	0.000	0.000	0.000

CONSISTANT STRESS RESULTANTS AT JOINTS ... UNITS.. IN & LBS

JNT	LC#	NX	NY	NXY	MX	MY	MXY
30	1	1121.693	-23.301	-80.875	0.000	0.000	0.000
31	1	1423.176	66.884	-155.592	0.000	0.000	0.000
32	1	-873.546	-194.652	-427.811	0.000	0.000	0.000
33	1	-843.824	-163.344	-370.292	0.000	0.000	0.000
34	1	-764.663	-116.222	-326.869	0.000	0.000	0.000
35	1	-661.846	-85.354	-286.653	0.000	0.000	0.000
36	1	-529.964	-59.482	-254.119	0.000	0.000	0.000
37	1	-376.657	-39.939	-225.398	0.000	0.000	0.000
38	1	-203.327	-25.751	-200.673	0.000	0.000	0.000
39	1	-12.740	-17.124	-179.001	0.000	0.000	0.000
40	1	193.081	-14.487	-159.392	0.000	0.000	0.000
41	1	411.905	-18.105	-140.979	0.000	0.000	0.000
42	1	640.566	-29.386	-119.075	0.000	0.000	0.000
43	1	874.126	-45.703	-96.860	0.000	0.000	0.000
44	1	1101.930	-69.771	-43.595	0.000	0.000	0.000
45	1	1311.829	-82.019	-54.845	0.000	0.000	0.000
46	1	-946.874	-220.529	-498.868	0.000	0.000	0.000
47	1	-882.610	-188.235	-404.622	0.000	0.000	0.000
48	1	-749.463	-140.133	-353.073	0.000	0.000	0.000
49	1	-610.537	-108.773	-299.830	0.000	0.000	0.000
50	1	-447.328	-84.358	-256.366	0.000	0.000	0.000
51	1	-268.104	-68.241	-216.612	0.000	0.000	0.000
52	1	-73.052	-59.265	-180.720	0.000	0.000	0.000
53	1	134.869	-57.101	-147.091	0.000	0.000	0.000
54	1	352.933	-60.843	-115.420	0.000	0.000	0.000
55	1	576.871	-70.379	-82.442	0.000	0.000	0.000
56	1	802.088	-80.906	-55.281	0.000	0.000	0.000
57	1	1018.247	-100.882	-6.353	0.000	0.000	0.000
58	1	1219.968	-90.586	-39.496	0.000	0.000	0.000

CONSISTANT STRESS RESULTANTS AT JOINTS ... UNITS.. IN & LBS

JNT	LC#	NX	NY	NXY	MX	MY	MXY
59	1	-988.503	-238.640	-538.970	0.000	0.000	0.000
60	1	-894.806	-209.032	-424.151	0.000	0.000	0.000
61	1	-719.547	-164.899	-366.148	0.000	0.000	0.000
62	1	-549.241	-135.501	-301.831	0.000	0.000	0.000
63	1	-358.426	-112.862	-247.698	0.000	0.000	0.000
64	1	-155.853	-98.230	-197.357	0.000	0.000	0.000
65	1	58.788	-90.376	-151.442	0.000	0.000	0.000
66	1	282.485	-88.124	-109.869	0.000	0.000	0.000
67	1	511.963	-91.043	-70.339	0.000	0.000	0.000
68	1	744.392	-94.024	-42.204	0.000	0.000	0.000
69	1	971.761	-106.787	3.539	0.000	0.000	0.000
70	1	1204.573	-85.098	-46.015	0.000	0.000	0.000
71	1	-997.223	-246.057	-556.658	0.000	0.000	0.000
72	1	-883.509	-219.602	-427.422	0.000	0.000	0.000
73	1	-676.119	-179.285	-363.516	0.000	0.000	0.000
74	1	-479.819	-152.002	-289.525	0.000	0.000	0.000
75	1	-264.568	-130.533	-226.443	0.000	0.000	0.000
76	1	-40.012	-116.229	-167.870	0.000	0.000	0.000
77	1	194.680	-107.395	-116.602	0.000	0.000	0.000
78	1	436.297	-104.069	-70.039	0.000	0.000	0.000
79	1	683.645	-101.016	-39.288	0.000	0.000	0.000
80	1	930.300	-110.229	8.374	0.000	0.000	0.000
81	1	1188.024	-82.808	-50.500	0.000	0.000	0.000
82	1	-986.459	-246.108	-559.956	0.000	0.000	0.000
83	1	-856.859	-221.288	-418.639	0.000	0.000	0.000
84	1	-621.937	-182.798	-349.230	0.000	0.000	0.000
85	1	-400.825	-156.655	-267.613	0.000	0.000	0.000
86	1	-160.151	-135.762	-198.241	0.000	0.000	0.000
87	1	89.505	-121.144	-136.131	0.000	0.000	0.000

CONSISTANT STRESS RESULTANTS AT JOINTS ... UNITS.. IN & LBS

JNT	LC#	NX	NY	NXY	MX	MY	MXY
88	1	348.972	-112.576	-81.186	0.000	0.000	0.000
89	1	616.944	-105.033	-45.319	0.000	0.000	0.000
90	1	887.324	-112.206	8.630	0.000	0.000	0.000
91	1	1174.525	-80.124	-57.659	0.000	0.000	0.000
92	1	-963.726	-241.515	-556.049	0.000	0.000	0.000
93	1	-818.778	-216.898	-401.611	0.000	0.000	0.000
94	1	-555.036	-178.400	-326.982	0.000	0.000	0.000
95	1	-306.366	-152.848	-238.805	0.000	0.000	0.000
96	1	-35.618	-132.216	-166.552	0.000	0.000	0.000
97	1	244.722	-119.191	-100.545	0.000	0.000	0.000
98	1	537.529	-107.961	-57.188	0.000	0.000	0.000
99	1	835.334	-113.852	6.595	0.000	0.000	0.000
100	1	1154.135	-78.210	-65.314	0.000	0.000	0.000
101	1	-932.067	-234.061	-548.785	0.000	0.000	0.000
102	1	-768.892	-208.836	-378.460	0.000	0.000	0.000
103	1	-470.295	-169.634	-298.542	0.000	0.000	0.000
104	1	-187.912	-144.373	-205.724	0.000	0.000	0.000
105	1	119.670	-125.896	-128.498	0.000	0.000	0.000
106	1	439.731	-111.025	-74.355	0.000	0.000	0.000
107	1	768.854	-115.527	2.532	0.000	0.000	0.000
108	1	1122.785	-76.596	-74.162	0.000	0.000	0.000
109	1	-889.149	-223.986	-538.899	0.000	0.000	0.000
110	1	-702.640	-198.390	-348.610	0.000	0.000	0.000
111	1	-359.641	-158.538	-265.277	0.000	0.000	0.000
112	1	-35.730	-135.452	-164.000	0.000	0.000	0.000
113	1	318.672	-115.312	-98.845	0.000	0.000	0.000
114	1	681.767	-117.456	-4.054	0.000	0.000	0.000
115	1	1075.222	-75.308	-84.810	0.000	0.000	0.000
116	1	-827.910	-210.360	-523.378	0.000	0.000	0.000

CONSISTANT STRESS RESULTANTS AT JOINTS ... UNITS.. IN & LBS

JNT	LC#	NX	NY	NXY	MX	MY	MXY
117	1	-611.421	-185.371	-311.007	0.000	0.000	0.000
118	1	-212.922	-147.271	-220.832	0.000	0.000	0.000
119	1	162.361	-122.740	-129.881	0.000	0.000	0.000
120	1	567.542	-119.394	-15.959	0.000	0.000	0.000
121	1	1002.277	-74.609	-97.751	0.000	0.000	0.000
122	1	-735.930	-190.897	-499.887	0.000	0.000	0.000
123	1	-482.595	-169.777	-258.385	0.000	0.000	0.000
124	1	-17.404	-131.885	-184.510	0.000	0.000	0.000
125	1	412.351	-121.147	-34.106	0.000	0.000	0.000
126	1	892.394	-74.635	-116.113	0.000	0.000	0.000
127	1	-592.862	-162.336	-449.207	0.000	0.000	0.000
128	1	-302.926	-148.748	-204.451	0.000	0.000	0.000
129	1	224.641	-118.768	-74.040	0.000	0.000	0.000
130	1	711.275	-76.924	-133.285	0.000	0.000	0.000
131	1	-379.907	-124.747	-385.406	0.000	0.000	0.000
132	1	-61.196	-114.549	-99.010	0.000	0.000	0.000
133	1	470.213	-77.955	-169.373	0.000	0.000	0.000
134	1	-146.011	-77.645	-180.620	0.000	0.000	0.000
135	1	81.883	-75.742	-110.872	0.000	0.000	0.000
136	1	32.064	-45.949	-254.252	0.000	0.000	0.000

VITA

Jon Mical Bass

Candidate for the Degree of

Master of Science

Report: CONSISTENT STRESS DISTRIBUTIONS IN FINITE ELEMENTS

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Biographical:

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